SHOUT
SHARE
IT

THE

CLASS PISCES

ARRANGED BY THE

BARON CUVIER,

WITH

SUPPLEMENTARY ADDITIONS,

BY

EDWARD GRIFFITH, F.R.S., *&c.*

AND

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THE FOURTH CLASS

OF

VERTEBRATED ANIMALS.

THE FISH

Is composed of oviparous vertebrata, with a double circulation, whose respiration nevertheless is effected exclusively through the medium of water. For this purpose they have on each side the neck an apparatus called gills, which consists of leaflets suspended to certain arches attached to the os hyoïdes, and composed each of a great number of successive laminæ, covered with a tissue of innumerable blood vessels. The water swallowed by the fish escapes between the openings of these laminæ, and acts by means of the air which it contains on the blood, which is incessantly impelled to the gills by the heart. The heart has only the right auricle and ventricle of the warm-blooded animals.

The blood after respiration passes into an arterial trunk situated under the spine, which performing the office of the left ventricle, disperses it throughout the body, whence it returns to the heart by the veins.

The entire structure of fish is as evidently adapted to swimming as that of birds is for flight. Suspended in a fluid nearly as heavy as themselves, the former have no need of wings to sustain them in it. A great number of species have immediately under the spine an air vessel, which by compression or dilatation changes the specific gravity of the fish, and assists it in rising or descending in the water. Progression is executed by the motion of the tail, which strikes the water alternately right and left, and forces the fish forward; the gills discharging the water backward probably contribute also thereto. Hence, the limbs being but of little use are greatly reduced; the pieces analogous to the bones of the arms and of the legs are extremely short or entirely concealed; rays more or less numerous, supporting membranaceous fins in some degree represent fingers and toes. The fins corresponding to the anterior extremities are said to be *pectoral,* those which answer to the posterior are said to be *ventral.* Other rays attached to particular bones placed upon or between the extremities of the spinous processes support vertical fins on the back, under the tail, and at its extremity, which by being erected or depressed, extend or diminish at the will of the fish, the surface which strikes the water. The upper fins are said to be *dorsal,* the lower *anal,* and that of the end of the tail *caudal.* The rays are of two sorts; the one consisting of a single bony piece, generally hard and pointed, but sometimes flexible and elastic, divided longitudinally, these are called *spinous rays;* the others, which are composed of a great number of small articulations, and generally divided into branches at the extremity, are called *soft, articulated,* or *branched rays.*

As to the number of limbs, we may observe as many varieties as among the reptiles. Generally there are four; some, however, have but two, and others are without them altogether. The bone which represents the scapula is sometimes suspended in the flesh, as in the previous classes; at other times, it is attached to the spine, but more commonly it is suspended to the cranium. The pelvis seldom adheres to the spine, and very often, instead of being behind the abdomen, it is before, and belongs to the humeral apparatus.

The vertebræ of fish are united by concave surfaces filled with cartilage, they in general communicate by a canal dug in the axis of the vertebræ; in the majority they have long spinous processes, which support the vertical form of the body. The ribs are often fastened to the transverse processes. These ribs and processes are commonly known by the name of crests or ridges.

The head of fishes varies more in form than that of any other class, although it is in general divided into the same number of bones as that of other oviparous animals. The frontal is composed of six pieces: the parietal of three; the occipital of five; five of the pieces of the sphenoid and two of those of each of the temporal bones remain in the composition of the cranium.

Besides the common parts of the brain, which are placed as in reptiles behind each other, the fish have also tubercles at the base of the olfactory nerves.

Their nostrils are simple fossæ at the end of the muzzle, almost always pierced with two holes, and lined with a pituitary membrane regularly plaited.

The eye has its cornea very flat, the aqueous humour little, but the crystalline nearly globular, and very hard.

The ear consists of a sac, representing the vestibule, and containing in suspension small masses, generally of a stony hardness, and moreover of three semicircular membranaceous canals, rather situated in the cavity of the cranium than engaged in the substance of its own parietes, except in the chondropterygians; there are neither eustachian tube nor tympanal bones, and the selacians alone have an oval opening (fenestra ovalis), but on the level of the head.

Taste in fish cannot be very acute, since their tongue is in great part bony, and is often furnished with teeth or other hard coverings.

The majority, as every one knows, have the body covered with scales; all are destitute of any organ for holding; certain little fleshy tendrils which some of them possess may supply the imperfection of touch in the other organs.

The intermaxillary bone forms in most of them the edge of the upper jaw, and behind it the maxillary, commonly called os labiale; a palatine arch, composed of the palatine, the two pterygoidian processes, a jugal bone, a tympanic and squamous bone, constitutes, as among birds and snakes, a sort of interior jaw, and supplies behind an articulation to the lower jaw, which has in general two bones on each side, but these pieces are less numerous in the chondropterygii.

Teeth are found on the intermaxillaries, the maxillaries, the lower jaw, the vomer, the palatines, the tongue, the arches of the gills, and even on certain bones situated behind these arches dependent like them on the os hyoïdes, and named ossa pharyngis.

The varieties of these combinations, as well as the forms of the teeth placed at each point, are countless.

Independently of the apparatus of the branchial arches, the os hyoïdes carries on each side certain rays which support the branchial membrane; a kind of lid composed of three bony pieces, the operculum, the sub-operculum, and the inter-operculum, is joined to that membrane to close the great opening of the gills; it is articulated to the os tympani, and moves upon a piece called the pre-operculum. Many of the chondropterygians have not this apparatus.

The stomach and intestines vary as much in volume, figure, weight, and circumvolutions, as in the other classes. Except in the chondropterygians the pancreas is represented either by cœca of a peculiar tissue, situated round the pylorus, or by this same tissue itself at the beginning of the intestines.

The kidneys are fixed along the sides of the spine, but the bladder is above the rectum, and opens behind the anus and behind the parts of generation contrary to what occurs in the mammalia.

The testicles are two enormous glands, commonly called the *soft roe* or *milt*, and the ovaries are two sacs nearly corresponding to the roe in form and size, and in the internal folds of which the ova are deposited. Some fish are capable of copulation, and are viviparous; their young break forth in the ovary itself, and are born through a very short canal. The selacians alone have besides an ovary, long oviducts, which sometimes lead into a true matrix, and they produce either their young alive, or eggs enveloped in a corneous substance: but most fish do not couple; and when the female has deposited her spawn, the male passes over and fecundates it by deposition of the milt.

There is more difficulty in dividing the fish than either of the other classes, into orders founded on fixed and obvious characters. After many trials I have determined on the following distribution, which in some instances is wanting in precision, but which possesses the advantage of keeping the natural families entire.

Fish form two distinct series, that of FISH, properly so called, and that of CHONDROPTERYGII OR CARTILAGINOUS FISH.

The general character of the latter is, that the palatine bones occupy the place of the bones of the upper jaw; the whole of the structure of these fish has moreover some evident analogies, which we will proceed to detail. It is divided into three orders :—

CYCLOSTOMATA, in which the jaws are united into an immoveable ring, and the gills open by numerous holes.

SELACHII have the gills of the preceding, but not their jaws.

STURIONES have the gills open in the ordinary manner of fish, by a single cleft furnished with an operculum or gill cover.

The other series, or that of the COMMON FISH, present to me at first a primary division of those in which the maxillary bone, and the palatine arch, are inserted in the cranium. Of these I make the order PLEGTOGNATHI, divided into two families, *gymnodontes* and *sclerodermata*.

Next, I find fish with perfect jaws, and with gills not in the shape of a comb, as is usual, but with a series of small tufts. Of these I also form the order, which I name LOPHOBRANCHII, and which includes only a single family.

Still there remains a very large number of fish to which no other characters can be applied than those of the exterior organs of locomotion. After a long series of researches, I find that the least objectionable of such characters are those used by Ray and Artedi, derived from the nature of the first rays of the dorsal and anal fins. The common fish may thus be divided into MALACOPTERYGII, in which all the rays are soft, except occasionally the first of the dorsal or pectoral fin, and into ACANTHOPTERYGII, in which the first portion of the dorsal fin, or the first dorsal fin, when there are two, is supported by spinous rays, and in which the anal fin has also some of these spinous rays, and the ventrals at least one each.

The former may be subdivided without inconvenience by the position of the ventral fins, in some situated behind the abdomen, in others suspended to the humeral apparatus, and in the remainder absent altogether.

We thus arrive at the three orders of Malacopterygian fish, viz. the ABDOMINAL, SUBBRACHIAN, and APODAL fish, each of which includes some natural families, which we will explain. The first especially is very numerous.

But a similar basis of division cannot be used in the ACANTHOPTERYGII, and the problem how to establish other subdivisions than the natural families, is still insoluble to me. Fortunately many of these families present characters nearly as precise as those that could be given to genuine orders.

One cannot assign to the families of fish ranks so determinate as to those of the mammalia. Thus the chondropterygii are allied in one respect to the reptiles by the organs of sense, and even by those of generation in certain of them, while they hold a similar alliance with the mollusca and worms, by the imperfection of the skeleton, in others.

With respect to the common fish, if any system of structure is more developed in some than in others, no consequent peculiarity is observable, sufficiently marked or striking to cause it to be taken into account in forming a methodical arrangement.

We will therefore treat successively of these two series, commencing with that which is most numerous, viz. the common fish, and we will begin these with the order which abounds most in genera and species.

ON THE

ICHTHYOLOGICAL SYSTEM

OF

BARON CUVIER.

We enter, at length, upon the last class of vertebrated animals in the natural system of Baron Cuvier, containing the Ichthyology or classification of Fish: but before we proceed to translate his description of the first order of fish in his "Règne Animal," it may be convenient to the reader for us to enlarge on his Ichthyological system in general. In the first edition of the *Règne Animal*, the part relating to this class was treated in a manner less perfect than in the second; for the author, having dedicated his time, during the interval between the two publications, to continued and thorough researches in Ichthyology, the increase of materials and information extended and modified his views, until he prepared the results for publication in a great and separate work, under the title of *Histoire Naturelle des Poissons*[1]. It is the abstract or condensed form of this work which we find in the second and improved edition of his Règne Animal, reduced in proportion, to the importance of Ichthyology in a general system of animated nature. As far as the daily progress of discovery in the natural sciences will permit, we may regard it as the final arrangement; for although nine volumes only of the great work have as yet issued from the press, they are in conformity with the classification in the Animal Kingdom, and we are assured the remaining volumes will be written on the same plan.

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[1] Histoire Naturelle des Poissons, par M. Le Baron Cuvier, &c. &c. et par M. Valenciennes aide-naturaliste, &c. his able and laborious assistant.

With this improved edition before us, and with the knowledge of the progress of the *Histoire Naturelle des Poissons*, we have considered that it would answer no purpose beneficial to the reader or to science, were we to attempt a distinct undertaking of our own, and, by anticipating the labours of the Baron, risk a distribution in opposition to the typical system, and substitute for his profound researches, descriptions liable to be soon after superseded, or perhaps controverted, by his own masterly pen, thus professedly engaged on the specific account of the whole class. It was therefore deemed most advisable, for the present, to confine the Ichthyological part of the animal kingdom to the version of the revised text in the second edition before noticed, with commentaries intended to interest the general reader; and, avoiding as much as possible dry details, to endeavour to communicate facts of a more popular nature, relating to the manners and characters of the whole finny race; to the habits of the larger groups; to the singularities observed in the nature of certain species; and to the fisheries, economical uses and historical facts connected with Ichthyology.

For this purpose, the learned introduction and extensive ground of research, embraced in our author's great work, furnish already abundant materials, and as the publication proceeds we may expect much valuable matter in the future volumes. But the progress of the Animal Kingdom requiring as little delay as possible, it is intended, in order to complete our descriptive parts, to refer in some places to other sources, and while we purpose, not indeed without hesitation, to point out in the notes, a few species which seem to have escaped the vigilance of the noble author, we may also venture to state a few observations of our own, collected during the course of many years, and repeated voyages to distant climates.

But the Synoptical Table of species, perhaps justly regarded by Ichthyologists as the most useful part in systematic treatises of this description, it is judged best to defer until the completion of the *Histoire Naturelle des Poissons;* when the author will furnish one from his own pen, corrected and improved to the final termination of that important work. Those who have made the natural history of fishes their particular pursuit, will best comprehend the propriety of delay on our parts, until this Synopsis is published: for although we might furnish a table sufficiently exact and conformable to the views of the author, as far as the published volumes of his great work would allow, many species which the Baron alone has been enabled to compare and finally determine, would be with us liable to a false location, and a vast number of others, as yet only described in his manuscripts, would remain unnoticed. Were we therefore to produce a synopsis confessedly incomplete, while one from our author thus highly qualified may be confidently expected, we should be justly liable to an imputation of disrespect to him and injustice to the public[1].

The title of the great work on the Natural History of Fishes has already been so often repeated, and we intend in the course of our observations to draw so largely from this invaluable source of information, that it will, we trust, be an acceptable service rendered those who are not in possession of the original, to devote a few pages to a slight sketch of this monument of erudition and research: for, if the numerous works of Baron Cuvier, had long before the present, satisfied the scientific of all countries, with regard to his unrivalled power of drawing great and striking conclusions, from an infinity of careful investigations: the history of fishes not only exhibits the same faculties, exerted in a long continued series of anatomical inquiries, but also as a display of literary acquirements, exceeds all his former productions in erudition. No source of information bearing upon the subject is overlooked, whether occupying a series of volumes or met with in a casual sentence; whether to be sought in the classical pages of antiquity, or in a modern pamphlet published in some obscure corner of Europe.

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[1] It is necessary to observe that this was written shortly before the lamented death of the Baron; but as the *Histoire Naturelle des Poissons* is still in progress under the superintendence of M. Valenciennes, the reason here suggested which has induced us to forego publishing a synopsis of the species at present, still exists.

It is in the review of the origin and progress of Ichthyology, prefixed to the history, that we become fully sensible of the magnitude of the writer's labours in this department alone. There we perceive with what critical sagacity he investigates every relative document, from those of the earliest antiquity to the present time; and traces out what is derived from a predecessor, and what is new in each. Our limits forbid us to enter so largely as we could wish, into his luminous and characteristic abstract, of all the real information, professedly or incidentally communicated by the ancients. From the period when Aristotle laid the foundation of the natural sciences, the author enumerates a succession of Greek and Latin writers, with a few words of their biography, and a synoptical view of what relates to his subject in their writings, though most of them were satisfied with commenting on the Stagyrite, scarcely ever adding a single new fact from their own observation[1]. Among the works thus referred to we find even the Halieuticon ascribed to Ovid, remarkable as containing the names of fifty-three species of fish then known[1].

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[1] Homer is mentioned on account of *γναμπτοῖς ἀγκίστροισιν*; Hesiod for the fisherman on the shield of Hercules; Plato, Archestratus, Theophrastus, Erasistratus, Clearchus, Varro, Columella, Pliny, Oppian, Athenæus, Ælian, Ausonius, Strabo, Pausanias, Plutarch, Dioscorides, Galen, Oribasius, &c. From comparing the whole the Baron infers that the ancients were acquainted with about 150 species of fish, nearly all that are edible in the Mediterranean.

In the decline of letters, we observe him consulting the fathers, although from such authorities only a solitary fact might perchance be elicited[2]. When letters were nearly lost, such writers as Isidore of Seville are mentioned, to show that the species of fish then known were reduced to a number scarcely exceeding thirty. As learning rekindled, and light spread anew, he commences a series of notices in chronological succession, amongst which we find the names of Albertus Magnus, Vincent of Beauvais, Massaria, Paulus Jovius, Gyllius, Lonicerus, Belon, Salviani, Rondelet, Conrad Gesner, Aldrovandus, Thevet, Lery, Clusius, Delaet, Nieremberg, Hernandez, Prince Jean-Maurice, Piso, Margrave, Bontius, Nieuhof: further on we find Haller, Borelli, Malpighi, Steno, Harvey, Swammerdam, Valisnieri, Needham, Collins, Jonston, Valentyn, Ray, Willughby, Sloane, Iago, Catesby, Hughes, Edwards, Marsigli, Artedi, and finally, Linnæus, Pennant, Pallas, Bloch, Lacépède, and an immense list of recent authors. Among the number here noticed, and still more of those whose names we have omitted, many are reviewed by the author, merely on account of a single anatomical record of some one viscus of a fish, or for observations on one particular species[3]. All the articles relating to ichthyology in the transactions of the numerous scientific societies of Europe, America, and in the

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[1] Pliny, xxxii. c. 2. ascribes this little poem to Ovid; it is found in some editions of his works, and in the Poetæ Latini Minores: but modern critics consider Gratius Faliscus as the author; perhaps for no better reason than that he wrote the Cynegeticon.—C.

[2] St. Ambrose, Comment on Genesis; Eustathius, Hexaemeron; even George Pisides. *ἑξαήμερον κοσμουργία*, &c.

[3] Among the researches in anatomy are a variety of inaugural theses and notices of isolated discoveries relating to ichthyology.

Indies, are passed in review; incidental notices in voyages and travels, topographical histories[1], narratives of tourists, the researches of political economists, whenever they touch upon ichthyology, are carefully examined. But no writers receive a more marked and just consideration, than those who in recent times have endeavoured to improve the science of ichthyology. The posthumous system of Bloch edited by Schneider, Walbaum, Gmelin, Lacépède, Dumeril, Blainville, Lesueur, Goldfuss, Müller, Risso, Rafinesque, Leach, Hamilton, Buchanan, and Shaw, are noticed, although the last named was scarcely more than a compiler; and Oken, the celebrated champion of idealistic philosophy, whose problematic attempts to deduce *à priori* from the general idea of being all the diversities of particular beings, by means of combinations of ideas of different degrees, is likewise subject to examination, on the ground of the general idea of *fish* leading, according to his method, to that of all kinds of fish; and so descending by successive gradations, as to form at length a kind of system; a system, by the way, which has already varied three or four times in the philosopher's productions.

Further on we find anatomists, particularly those who have of late made researches on the air-bladder, and the osteology of the heads of fish. Autenrieth, Geoffroy St. Hilaire, Rosenthal, Spix, Bojanus, Carus, Schultz, Vander Hæven, Bakker, Meckel, Serres, Majendie, Kuhl, Apostole-Arsaki, Rathke, Sir

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[1] In a note many of our county historians are enumerated; Wallace, Leigh, Morton, Coker, Taylor, Dale, Plott, who have furnished what they were pleased to designate as natural history, although their descriptions are almost invariably in arrear of the science, such as it was when they wrote; even Borlace and Wallis are considered as not being wholly exempted from this reproach; nor is this a wonder, when for half a century after Ray and Willughby published their labours, Englishmen, professed naturalists, appear not to have known them, and the erudition of Pennant contributed more to his fame abroad than at home.

Everard Home, Tiedemann, Humboldt, and many others, occur.

Nor are iconographical illustrations passed over; from those singular pictures still remaining engraved and coloured on the walls of ancient Egypt, to the most recent collections of plates and drawings, such as the Plumierian, that of Prince Jean-Maurice of Nassau, the Commersonian, the Banksian, the Japanese encyclopædia and paintings of fish, Dussumier's Chinese drawings, the plates of Reynard, Don Antonio Parra, Russel, Mocigno, &c. Thus having digested all the observations written or pictorial records could furnish, we find him no less active and persevering in personally examining the anatomy [1] of many hundred species, with a tact and minuteness peculiarly his own, and employing for this purpose the immense stores preserved in the museum of Paris, and the numerous collections of fish supplied to him by the emulation and zeal of princes, naturalists, and collectors, from every part of Europe, and from distant regions.

Although the difficulties attending researches on subaqueous animals had hitherto opposed the equal advance of this branch of the natural sciences, it was evident, that when a more continued investigation into the structure of fishes, and a more extensive examination of their species, should have dispelled the obscurity still hanging over ichthyology, a new method of classification would speedily be sought, more conformable to the advanced state of the other branches of natural history. No one can have been more fully sensible of the necessity of a new system than our author, for long before the different attempts made for this purpose, by several of the naturalists before mentioned, he had already commenced in silence the career of deep researches which form the basis of his present system[1]. But even at the present moment, as successive volumes of his great work appear, we find that the ameliorations which have been from time to time introduced still undergo revisals and further improvements.

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[1] We have had the honour repeatedly to witness the author in his study, with the dissecting knife in his left and the pencil in his right hand, laying open the parts required, and sketching in a manner so spirited and bold, as to be only surpassed by its fidelity. C. H. S.

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[1] Baron Cuvier commenced his labours in ichthyology in the year 1788, by studying and dissecting species near their native element, on the coast of the Channel and Normandy. He resumed this kind of labour at Marseilles in 1803, and in the years 1809, 1810, and 1813, at Genoa, and on different parts of the coast of Italy. At different periods he visited and inspected many museums of the continent and of England, and carried his researches so far, as to send his assistant, M. Valenciennes, to Antwerp, to ascertain the question of the existence of the tripteronotus, or daulen of Rondelet. Besides the constant supply of fresh specimens furnished to him at Paris, he could examine the collections (mostly in spirits) called the Old, in the King's cabinet; that of Peron, from the Pacific; of the Stadtholder of Holland, brought from the Hague, and mostly collected in the Indian Seas; another Indian series, named Commersons; those of Laroche, from Iviça; and of Lalande, from the Mediterranean; all of which were consulted for the first edition of the Règne Animal. Since that time, the French navy and scientific travellers, in obedience to the directions issued by the ministers of marine and the interior, have caused great additions to be made to the stores in the royal museum. Strangers also have zealously co-operated in his wishes. Messrs. de Lalande and Auguste St. Hilaire, Prince Max. of Neuweid, and Mr. Spix, furnished specimens from Brazil; Messrs. Richard and Leblond, Poiteau, Leschenault, and Doumere, from Cayenne; Messrs. Pley, Lefort, Achard, Ricord, and Poey, from Martinico, Guadaloupe, Porto Rico, Columbia, St. Domingo, and Cuba; Humboldt, from the Cordilleras; Bosc, Milbert, Lesueur, De Kay, Mitchill, and Pylaie, from the United States and Newfoundland; Mr. Richardson, from the Polar regions; Messrs. Roger, Geoffroy, and Mareschaux, from Senegal, Egypt, Tunis, and the Bisertan lake; Sonnerat, Leschenault, and Mathieu, from the Indian Ocean, Isles of France and Bourbon; Messrs. Diard and Duvaucel, Kuhl and Van Hasselt, Reinwart and Temminck, from the Australian seas, the Moluccas, the Ganges, and upper rivers of India; Dussumier, from China; Ehrenberg, from the Red Sea and Nile; Tilesius and Langsdorff, from Japan and Kamtschatka; Messrs. Risso, Bonelli, and Savigny, from Nice and Italy; Biberon, from Sicily; Leach, from Malta; Admiral de Rigny, from the Levant; Gamba, from the Phasis and Don; the Grand Duchess Helena of Russia, fish from

Before his first publication on the subject in 1815, the methods adopted by nearly all Ichthyological writers, although apparently very different from each other, were nevertheless only modifications of the Linnæan system, with new names. Some having no alterations, excepting that they introduced classes, pretended to be imperfect, and founded upon the supposed absence of a part of the branchial teguments, as advanced by Lacépède, or upon the nature of the gill rays, as they are represented in Artedi. All these arrangements being purely conventional or artificial, produce an irremediable objection, in the remote separations which they cause, of species naturally allied or approximating; and moreover in their assigning characters not always to be found in the species they include. But our author, having for nearly forty years studied Ichthyology, not only in authors but much more the subjects themselves, in their viscera and their skeletons, after dissecting several hundred species, satisfied his mind that no acanthopterygian fish should ever be mixed with those of any other family; and that the acanthopterygians, constituting three-fourths of all the known species of fish, are also the type most perfected by nature and most homogeneous in all the variations it has received[1].

From the year 1817, when the Tableau du Règne Animal first appeared, the Baron having shown the erroneous characters derived from the opercula and rays, suppressed the old order

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every part of the Muscovite Empire; Messrs. Quoy and Gaymard, Garnot, and Lesson, from the Pacific Ocean; and many others from the north of Europe, and the rivers and lakes of Germany, France, and Italy.

[1] Acanthopterygians include all the fish having complete gills and fins, partly armed with spines or pointed bones.

of branchiostegi, and formed that of plectognathi[1]. He was thus enabled to bring together many species formerly kept remote, particularly those of the muræuæ. His principal object being an arrangement which would show a class of animated beings according to their real affinities, his efforts were unceasingly directed towards the construction of real natural families, and when these were established, to the arrangement of the genera, and their subdivision into subgenera, so as to facilitate the knowledge of the species, by locations as far as possible suited to their mutual relations.

In this view the Baron states in substance, the Acanthopterygian character assumes a preponderance over all the others, and renders them secondary, and incapable of being placed in opposition to it. The very constancy of the characters materially increases the difficulty wherever it exists, to find precise and sensible distinctions for subordinate application; different tribes of Acanthopterygians passing from one into the other by such gradual transitions that the line of demarcation between them is scarcely perceptible.

Thus the percoides, essentially distinguished from the sciænæ by their palatinal teeth, includes a group of some strength, and completely natural in every other respect, but that one part of it is provided with that kind of teeth, and the other is without them. The same case recurs in the mailed cheek family, in other respects distinctly characterized; the greater number of the genera being linked to the percoides; and the other to the sciænoides by the circumstance of their having teeth on the palate. The sciænoid genera approach in part to the chætodonoids by the sensible character of the scales which spread over some parts of their vertical fins, and in part they assimilate with the sparoids by the total absence of their scales.

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[1] Branchiostegi formed an order of fish with free branchiæ, and what was called a cartilaginous skeleton. Plectognathi, bony fish with gill rays and operculum concealed by a thick skin, allowing but a small opening, and having the maxillary bone soldered to the side of the intermaxillary, which forms alone the jaw, the upper having no motion.

Gradations no less delicate connect certain genera of the spari, such as the smaris and gerres, with others like the equulæ, which cannot be remote from the zeus; and these lead in their turn to the scombri, who finally pass by gradations so sensible into riband shaped fishes or tænioïdes, as to make the point of separation undeterminable. Naturalists, therefore, who were solicitous to place animated beings according to their relative characters, had no choice but to group the acanthopterygian fishes, known in other systems by the generic names of perca, sciæna, sparus, chætodon, zeus, scomber, cepola, &c. into one vast family, notwithstanding the immense number of species it includes. It is true certain shades, indicating subordinate groups, are perceptible, but no species is so circumscribed by distinct peculiarities, as to suffer complete separation.

There is not quite so intimate a connection among the Lophii, Batrachi, Gobii, Blennii, and Labri, their characters are in general sufficiently clear, and though in part anatomical, they are readily discovered; the small opening at the gills of the first of these groups, with pectoral fins prolonged in the form of arms; similar pectorals joined to three rays of the ventrals in the second; the flexible spines on the backs of the third and fourth; the fleshy lips of the fifth; and, finally, the total absence of cœcal appendages in them all, are sufficient to divide them from all other acanthopterygians; and this last-mentioned character begins to approximate them towards siluri and cyprini, whose families are at the head of the malacopterygian, and in their turn link themselves with acanthopterygians by the spines of some of the fins.

The Malacopterygian[1] families are marked with stronger differences and characters more readily perceived; some are both natural and distinctly limited, so that each is not only clearly separated from others, but also retains within itself a great resemblance in the details. This immutability is so obvious in most of the natural families formed in this part of the class, that Artedi had already marked them to form several of his genera; such as Silurus, Cyprinus, Salmo, Clupea, Esox, which may remain unbroken: in this case there is not even any inconvenience in distributing them by the position of the ventrals, because that character, however trivial in itself, is with them perfectly constant: but it must be observed that the distinction of jugular, thoracic, and abdominal fishes, cannot be maintained in the manner established by Linnæus. It is, in fact, of small consequence, whether the ventrals protrude a little before, a little behind, or exactly beneath the pectoral fins; but the circumstance of importance, and which is connected with the structure of the fish, is whether the pelvis be attached to the bones of the shoulder, or whether it be simply wrapped in the muscles of the belly. To designate the fish belonging to the former of these categories, the name of sub-brachians has been given, without adverting to the position of the ventrals, because that is a mere consequence of the greater or less length of the bones of the pelvis; and that of abdominals was left to the latter. As for the apodes, they naturally form the malacopterygians, without ventral fins.

The history of fishes opens with the acanthopterygians, who in reality constitute only one immense family. After them follow the different families of malacopterygians, in the order of their approximation to the acanthopterygians; but it is not to be inferred that they approach only in one line and in one series. If the abdominal malacopterygians may be ranged in this manner, and may commence even with those who have some spinous rays, neither the apodal nor sub-brachians should follow them. The gadi, for instance, are as nearly allied as any abdominal fish, to certain acanthopterygians, and there would be no reason to place them after the abdominals, if the question were mooted respecting the station they should hold in nature. If they are mentioned after them, it is because the exposition of facts in a book must necessarily be in a successive order.

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[1] For the definitions of these terms we refer to the articles themselves in the Animal Kingdom.

The same observation is applicable to the rest of the fishes; to those whose upper jaw is fixed, to those whose branchiæ are in tufts, and in particular to the great and important family of chondropterygians, which terminate the class. It is chiefly in the last mentioned, that the futility of classing animated beings in a single series is visible. Several of its genera, the rays, and sharks, among others, are considerably above common fish, by the complicated nature of their organs of sense, and of the organs of generation; which are more developed in some parts than those even of birds; yet other genera which are approximated by evident transitions, such as lampreys and ammocoetes, become so simplified, that they have been regarded as forming a passage to articulated worms; for the ammocoetes certainly possess not any skeleton, and their muscular apparatus is attached solely to membranous and tendinous supports.

Let it therefore never be supposed, that because one genus, or one family, is placed before another, we consider it more perfect, or superior to the others in the system of beings. He alone could build up such a pretension, who would attempt to place animal nature on a single line; such a project we have long since renounced, as one of the most false that can be entertained in natural history. We should, on the contrary, consider each being, each group of beings, in itself, and in the character it sustains by its properties and organization, and abstract none of its relations or connexions with other beings, whether they be near or remote.

When this mode of viewing animal nature is once attained, the difficulties disappear, and nature seems to assume a spontaneous arrangement in the eye of the naturalist; our artificial systems attempt only to fix the nearest relations; they seek merely to place one being between two others, and contrive to be ever at fault; true method sees each being in the middle of all the others, and shows all the radiations that link it more or less intimately in the vast web of organic nature; and thus alone we acquire enlarged ideas, worthy of that nature and of nature's God; but ten or twenty rays will be often insufficient to express these multifarious relations. It is therefore in the descriptions, that the idea to be formed of the degrees of organization is to be sought, and not at all in the place assigned to the species; not that it is meant to be inferred, that there is no classification possible, or that species should not be formed into groups, and embraced in definitions. On the contrary, these approximations are so real, and our understanding is so powerfully inclined to them, that in all ages even the vulgar have formed their genera, as well as naturalists.

Therefore, what nature assimilates we have approximated, without forcing into the groups beings that do not belong to them; and we make no scruple, after having arranged together all the species, for instance, of a well-defined genus, or all the genera which admit of being formed into a clearly circumscribed family, to leave out one or more isolated species or genera, which do not link themselves naturally with the others; preferring these kinds of irregularities, if they deserve that name, to misleading the reader, by suffering anomalous species or genera to remain within a series whose characters are not completely applicable to them.

Such are the views the author entertained, when he adopted the classification of his system; for in the explanations here offered, we have followed the scope of his arguments almost verbatim[1]. To us at least they appear conclusive, and place in a strong light the real superiority of a method depending upon affinities, over one founded on mere coincidences.

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[1] Chap. x. distribution des poissons, &c.

SUPPLEMENT

ON

FISH IN GENERAL.

GENERAL VIEW OF THE NATURE AND ORGANIZATION OF FISHES.

More than two-thirds of the surface of the earth are covered by the sea; the continents and islands every where intersected by rivers of all sizes, and overspread with lakes, ponds, and marshes, present an aggregate of waters so considerable in extent as to exceed the dry land, and afford space within them to animated beings no ways inferior in number and in variety of species to those which inhabit the earth. On land, the matter susceptible of life, is in a great measure employed in the constitution and maintenance of vegetable productions; from these herbivorous animals draw their food; which, becoming animalized through this medium, affords proper aliment to the carnivora, who do not constitute more than one half of the terrestrial species of all classes. But in the water, and particularly in the sea, where the vegetable kingdom is much more restricted, all organized substances appear to be animated, or ready to become so: existing at the expense of each other, or deriving sustenance from the mucosities or other detritus of living bodies. In that element the animal kingdom presents the extremes of bulk and minuteness: from the myriads of monads, and other creatures, which would ever have remained invisible to us, but for the marvellous powers of the microscope, up to whales and cachalots, surpassing twenty fold the largest terrestrial animals. There also we discover more particularly those grand combinations of organs on which naturalists have founded the distinction of classes: or to speak more correctly; the sea contains representatives of all the classes. For if we look to the class of birds, so essentially aerial in their nature, we find nevertheless that the penguins are by their structure imperatively attached to the waves of the ocean. If we turn to the mammiferous class we equally notice species and whole genera devoted to the waters, such for instance are seals, morses, and manatis, who are not formed to forsake the sea, and the whole of the whale tribe, (cetacea) who can not even quit the liquid element, notwithstanding that their respiration compels them incessantly to rise to the surface. Reptiles are represented in the waters by tortoises, (chelonians), crocodiles, serpents, and in particular by the whole family of batrachians. Insects are, in great numbers, aquatic even in their perfect state, and a greater number still, do not rise into the air, to reproduce their species and expire, until after they have passed a much more considerable part of their lives beneath the waters in the state of larvæ and nymphs. Finally, in that element we look for almost all the molluscæ, the annelides, crustacea, and zoophytes; four classes, which, upon dry land, barely offer a few isolated representatives. Hence the ancients considered, and it is the remark of Pliny in particular, that "Quicquid nascatur in parte naturæ ulla, et in mari esse; præterque multa quæ nusquam alibi." 4. ix. c. 11.

But amongst the innumerable creatures which people and vivify the vast extent of the liquid element, none predominate so much, none are so exclusively confined to water, nor so much the object of our notice, for the variety of their forms, the brilliancy of their colours, and still more for the endless benefits they confer on man, than those which belong to the class of fishes. The superior importance of fish alone caused their name to be extended to all aquatic animals; ancient authors, and even writers of the present day, together with the *precise* terminology of the law, are liable to the imputation of misapplying the name of fish to cetaceous animals, and to mollusca and crustacea, although the confusion of ideas produced by the misapplication of the term might be avoided the more easily, since fish are a class of animals which can be most readily circumscribed by invariable characters[1].

The definition of fish, such as we find it in the writings of modern naturalists, is perfectly clear and precise. They are *vertebrated animals with red blood, breathing through the medium of water by means of branchiæ.* This definition is the result of observation; the product of analysis, or what is termed in physics, an empirical formula: but demonstrated to be correct by the inverse method: for, when properly taken, the whole nature of the animals to which it is applicable, can in some measure be deduced from it. Being vertebrated they must possess an internal skeleton; brain and spinal marrow inclosed within the vertebral column; muscles on the outside of the bones; they must have four extremities only; the organs of the first four of the senses in the cavities of the head, &c. As aquatical beings, that is as residents in a liquid more ponderous and obstruent than air, their locomotive organs required to be disposed for progression: to ascend being readily obtained, their structure became necessarily subservient to the forms which would cause least resistance forward; hence their tails received the principal muscular power, and the members were left short, but expansible and furnished with membranes to support them; and their teguments were made smooth or scaly, and totally free from hairs or feathers.

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[1] A few years ago there was a trial at New York upon this subject: the payment of duty upon whale oil being resisted on the ground that the words of the law were confined to oils produced from fish, and as whale was not fish, the oil from that animal, it was contended, did not come within the letter of the law. To support the allegation, naturalists of ability and Professors of the University gave it in evidence that whale were not fish; but the jury would not be convinced by the learned distinctions of science, and gave a verdict according to what they conceived to be the meaning, though it was not the letter, of the law. It might, however, be as well a question of investigation with legislators, when framing enactments where scientific terminology and definitions are applicable, whether there would not be an advantage in the admission of the phraseology, particularly of naturalists, which embraces such exact definitions that they cannot be evaded or misinterpreted, and therefore would in that particular obviate all the vagueness so often reproached to the framers of legal instruments. The definition of what we are to understand by the word fish above given, is a proof in point. The Church of Rome regards coot as fish, and why should seal oil not be the produce of fish in a legal view, since whale is classed with them?

As they breathe through the intervention of water alone, that is, as they restore to their blood its arterial qualities by means of the oxygen contained in the air which is suspended in water, the blood is naturally cold; and their vitality, the energy of their senses and of their movements is consequently less than in mammalia and birds. Thus, their brain, although it be similarly composed, is proportionably much smaller, and the external organs of the senses are not of a nature to impress it with powerful excitements[1]. Of all vertebrated animals, fish, in fact, show the least signs of sensibility. Having no elastic air to act upon, they are destitute, or nearly destitute of voice, and of all the sensations which that faculty awakens or supports. Their immoveable eyes, their fixed osseous face, their members without inflections, moving by totality, have no play in their physiognomy; no expression of their emotions; their ears on every side inclosed within the bones of the cranium, destitute of an external conch, without an internal cochlea, and being composed only of several sacks and membranous channels, can be scarcely sufficient to cause the loudest sounds to be heard. They have in reality but small occasion for the sense of hearing, being condemned to reside in the empire of silence, where all around is mute. Their eyesight would have but little exercise, in the depths they inhabit, if the large proportions of the visual organ in most species, did not obviate the scantiness of the light; but still the eye can scarcely change its direction, still less alter its dimensions, so as to be accommodated to the distances of objects; the iris can neither be dilated nor contracted, the pupil always remaining the same, under every degree of light. No tear moistens, no eyelid shelters or wipes the surface; it is, in fish, only an indifferent representative of that beautiful and animated organ which is found in the superior classes of animals.

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[1] The brain of fishes appears to have an embryonic character when compared with that of warm-blooded animals, and to have its greatest development in the cerebellum, the seat of the appetites.

Compelled to subsist by the chase of prey, which swims likewise with more or less rapidity; having no means of securing it but by deglutition, delicate sensations of taste would have been useless, even if nature had bestowed that quality upon them: but their tongue, almost immoveable, often wholely osseous, or beset with dental plates, and receiving only few and slender nerves, sufficiently shows the organ to be blunted, as from its confined use might be inferred. The sense of smelling cannot be in fish so continually operating as in animals breathing the air, whose nostrils are continually traversed by odorous vapours. To conclude, their sense of feeling almost obliterated on the surface of their bodies by the interposition of scales, and on their members by the inflexibility of the rays, and dryness of the membranes enclosing them, is confined to the tip of their lips, which in some species are themselves converted to the hardness and insensibility of bone.

Hence the external senses of fish cause few lively and distinct impressions; nature must appear indistinctly around them: their pleasures can be but little varied; the sufferings which they may have to apprehend from without, nothing more than pain from actual wounds. The want which, excepting in the season of love, causes all their activity, must be the sensations resulting from hunger. When not engaged in reproducing the species, their predominant passion to devour, almost their sole occupation. Their entire conformation, all their organs of motion, appear intended for that purpose alone. To pursue a prey, or to escape a destroyer, is the constant occupation of their lives; determines their choice of residence; is the principal object of the differences of form among them, and the intention of the small portions of instinct and of artifice, which nature has conferred upon some of the species. The angling filaments of lophii—the extensile jaws of epibuli and corici [1]—the terrible electrical shocks caused by torpedos and gymnoti, have no other object.

Fish are but slightly affected by the variations of temperature; not only because the changes are less in the element they inhabit, than in our atmosphere, but also because their bodies, assuming the temperature of the surrounding fluid, the contrast of external cold with internal warmth scarcely exists for them [2]. Hence the seasons are not the exclusive regulators of their migrations and periods of propagation, as they are with mammifera, and still more with birds. Several species spawn in winter; it is towards autumn that herrings, having frequented our northern and eastern coasts since the month of April, first begin to scatter their roes and milts on the south side, and on the French shores. It is in the north that the class of fish displays its most astonishing fecundity; not so much in the variety of species as in the multitude of individuals of a species, and the sea nowhere else produces an abundance of fish, approaching to the myriads of herring and cod emanating from that quarter.

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[1] Sparus Insidiator of Pallas, and some species of the genus lutjan of Risso, &c. all endowed with the power of suddenly projecting their jaws almost half their own length beyond the head.

[2] It has been observed by Dr. Armstrong, of the Royal Naval Hospital, Plymouth, that the temperature of fish is not only lower than that of the sea at the surface, but varies considerably in different individuals of the same species. On the banks of Newfoundland, 3rd September, 1829, when the temperature of the air was 66°, and of the water at the surface 64° Fahrenheit, a thermometer placed on the abdomen of nine cod-fish drawn up in succession from a depth of forty fathoms, indicated the following degrees of temperature, viz. 37°, 46° 41°, 35°, 36°, 40°, 39°, 38°, 36½°.

The sexual emotions of fish, cold as their own blood, indicate only individual wants. Few species are destined to pair, and enjoy connubial gratifications; the males, in others, seek the roes when spawned, instead of the females; they are reduced to fecundate eggs without a knowledge of the mother, and without seeing the produce. The joys of maternity are equally denied to the greater number of species; some only bear their eggs for a given time; with scarcely an exception, fish do not construct a nest; they neither feed nor defend their young; in short, their economy, even in the smallest details, is totally the reverse of that of birds.

The creatures of the sky distinctly survey an immense horizon; their acute hearing appreciates every sound, every intonation; and their voice is empowered to reproduce them. If their bills be hard, if their bodies be covered with down, to protect them from cold in the elevated regions of flight, yet according to Cuvier, all the delicacy of touch is found in their feet. They enjoy all the sweets of conjugal and of parental affection; execute all the duties thereto belonging with courage; mates defend each other; both defend their offspring; a surprising art is shown in the construction of their habitation; the joint labours of both executed in the proper season. While the female broods over the eggs with admirable constancy, the male, from an ardent lover, is converted into an attentive husband, and charms by his song the tedious occupation of his companion. The principle of attachment exists in captivity; the bird knows its master, submits to his order, and performs for his service acts of the greatest nicety; hunts for him like a dog, and returns at his call from airy flight to his wrist. It can even imitate his language, and it is with some reluctance that we admit its want of a species of reason.

The inhabitant of the waters, on the contrary, knows no attachments, has no language, no affections; feelings of conjugality or paternity are not acknowledged by him; ignorant of the art of constructing an asylum, in danger he seeks shelter beneath the rocks, or in the darkness of the deep; his life is silent and monotonous. The cravings of voracity alone influence his instinct sufficiently to teach him some kind of obedience in his movements to external signs. Although so small a share of enjoyment and of intelligence is their lot, fish are nevertheless adorned by the hand of nature with every kind of beauty: variety in their forms, elegance in their proportions, diversity and vivacity in their colours, nothing is wanting to attract the attention of man, and indeed it seems as if that attention was the particular object nature wished to excite. The splendour of every metal, the blaze of every gem, glitter on their surface; iridescent colours, breaking and reflecting in bands, in spots, in angles, or in undulating lines, always regular, symmetrical; graduating or contrasting, but always with admirable effect and harmony, flashing over their sides; for whom else have they received such gifts, they who at most can barely perceive each other in the twilight of the deep, and if they could see distinctly, what species of pleasure could they receive from such combinations?

Allurements like these no doubt have caused man from the remotest ages to direct his attention to animals of this class; and the abundant food they supply tempted him to pursue them among the first for his prey. Many entirely ichthyophagous tribes still subsist, and among civilised nations many families draw nearly the whole of their sustenance from fishing. Those who dwell on islands and coasts watch and catch the numerous species haunting their rocks, and more adventurous seamen sail to distant parts, for the purpose of attacking the shoals of migratory fish in the middle of the ocean ; and while the finny produce supplies the community at large, it is not the less an object of the greatest luxury to the rich. When Rome was the abyss where the treasures of the world were swallowed up, sums were expended on this particular kind of luxury, which to us appear almost incredible. Immense preserves were dug for both sea and fresh water fish; some were conveyed living from distant seas, others were produced alive upon the table, where it was thought entertaining to observe the varying hues of their expiring state[1]. By the assiduous cultivation of this species of economy an impression appears to have been made upon the habits of fish greater than might have been expected from their nature; some were taught to know their master, and attended to their proper names when called; for such, at least, are the relations of authors who notice the facts, as a surprising effect of industry stimulated by luxury[2].

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[1] "Mullum expirantem versicolori quadam et numerosa varietate spectari, proceres gulæ narrant; rubentium squammarum multiplici mutatione pallescentem; utique si vitro spectetur inclusus." Plin. l. ix. c. 17. See also Seneca, Quest. Nat. l. iii. c. 18. and Petron. Carm. de Bell. Civil. v. 33.

[2] Martial, l. iv. Ep. 30. v. 3.

> "Sacris piscibus hæ natantur undæ,
> Qui norunt dominum manumque lambunt
> Illam qua nihil est in orbe majus.
> Quid quod nomen habent et ad magistri
> Vocem quisque sui venit citatus."

By observations made on the species while under the eye, in preserves, and by collecting the remarks of fishermen, we have acquired all that is known of the habits of fish; but it is probable that many of their most secret manners have escaped observation in the depths where they pass most of their lives. Some are solitary, others gregarious; some traverse immense distances, others again are always sedentary, never abandoning the deep where they commenced existence. The quality of the bottoms determines also the habitation of many species. Some are found only along the rocky coasts of the sea; others continue in the purer depths of the offing; others again prefer stagnant pools, turbid holes, or remain sunk in the mud or sand, and among these several do not perish when the waters no longer cover the places where they lie buried, provided the least moisture remains. The stationary characters of some, as, for example, of the rays and anglers, contrasts with the rapidity of motion observed in others, but more particularly in the different species of mackerels; again, there are several, such as eels and periopthalmi, who can live for some time in the air, and crawl on the ground; and the anabas, it is said, will climb up into trees, and establish himself in the small collections of water, which are gathered at the roots of the leaves of several kinds of plants. Pirabebes and exoceti have pectoral fins, sufficiently large to raise and sustain them in the air over a given distance; and finally, species that practise the most remarkable act of instinct in the whole class, when pursuing

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And l. x. ep. 30.

> "Piscina rhombum pascit et lupos vernas
> Natat ad magistrum delicata muræna.
> Nomenculator mugilem citat notum
> Et adesse jussi prodeunt senes mulli."

Pliny notices the same fact. l. x. c. 70. "Spectatur et in piscinis Cæsaris, genera piscium ad nomen venire, quosdamque singulos."

their prey, such as the toxotes and chætodon rostratus, who bring down insects for prey by blowing a drop of water upon them to some distance: but all these differences of habit, may be principally ascribed to differences of conformation, and it would be vain to attempt an explanation of them without a particular study of all the parts of the body of fish, the differences between their structure and that of other vertebrated animals, and the modifications it undergoes in different families, genera and species.

Thus far we have chiefly followed our author in his general view of the nature and organization of fish, but before we offer his concluding observations it may be agreeable to the reader to find some further remarks, equally the result of conformation, and applicable only in considerations which embrace the whole class, such as respect the geographical distribution, the nature of the residence, the migrations of fish, their powers of vitality, &c.

DISTRIBUTION, HABITAT, MIGRATIONS, &c. OF FISH.

The watery element where fish were appointed to reside, not being, as already noticed, liable, like the atmosphere, to great and rapid alternations of heat and cold, and the blood of fish remaining in a temperature often lower than the surrounding fluid, none of the greater divisions of this class of animals are so strictly confined to either high or low latitudes as those of others breathing the air. But there is a circumstance affecting fish, to which in their turn animals with lungs are strangers; namely, the difference in density and chemical properties between fresh and salt water; the species belonging to each being unable to exist in the medium proper for the other, excepting some who pass with impunity from one into the other, at pleasure, or during certain seasons. In other respects, few natural families are without some genus or species to represent the forms and duties of its congeners in every sea. It is true, that we are not acquainted with what species, or in what numbers, the great depths of the ocean are more particularly inhabited; but we may infer by analogy, from the conditions of existence in all the vertebrated animals, that life under a continually increasing pressure, in proportion to the depth of the superincumbent column of water, must at a given point reach the limit where eternal darkness renders the organs of sight unavailing, and consequently the power of obtaining or avoiding prey impossible; still lower, where all the action of animal life must cease, where the gravity of no animal matter will descend, and finally, where even metals must remain suspended. Many atmospheres of water above these, we may therefore conclude to be the region where fish in a natural state can reside; comparatively, in short, at no great depth, and possibly not far below one hundred fathoms. For the bottom of the sea already, before reaching to such depth and lower beneath it, no longer offers, or at least scarcely offers, to the observer on the deep sea lead, aught except broken shells, teeth of fish, sand, and rock. No nets exceeding half that depth are anywhere in use, and the fish which are sometimes caught at fifty fathoms below the surface, are in general of species provided with eyes of such magnitude as to indicate the probability that their enlarged organs of sight are necessary in a medium so dense and remote from the light. Light, the manifestation of the solar action, is necessary in a greater or less degree, diurnally or at greater intervals, to the whole of organic nature; the species, therefore, which periodically rise from the deep, and after a space return again, acquire the powers of alternating their stations nearer the surface and sinking to repose at remoter distances from the operation of some action not unconnected with heat; and therefore their retreats are probably not far beneath the known superficial currents of the sea, and confined to the recesses of the shelving bases of continents, islands, and submarine elevations; there they may grovel in inaction, or perhaps hang suspended in a blind and torpid equilibrium, till a solstitial day or increasing warmth on either hemisphere, or the periodical changes of a monsoon, stimulating their organs into new excitement, recommences the period of activity[1].

The business of gregarious fishes, such as approach the shores periodically, appears to be confined to spawning, or feeding upon some particular bait, or both. Among these, the gadoid and clupeoid families advance from polar and temperate latitudes towards the equatorial seas: while the mugiloid and scomberoid tribes take a contrary direction, from the warmer latitudes towards the temperate seas. But all the fish of passage, though some feed on mollusca, at greater depths, are necessitated to deposit their spawn from soundings of at most forty fathoms to the superficial sands and rocks within the tides; and thus far we may judge the solar rays to penetrate with effect, not only from the quickening of their eggs, but also from the same action upon those of all the other species of fish, and of the pullulations of the subordinate classes of animated beings; excepting perhaps the zoophytes of some tropical regions, who commence their stony structures under a vertical sun at greater depths, and those pelagian animals whose spawn floats on the surface [1]. While the migratory tribes deposit upon the zone of soundings just mentioned the germs of their own future brood, to be in part devoured by other species, they find in their turn the ova and the fry of those species, and also the already matured new generations of the subordinate classes, to serve for their own subsistence.

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[1] A fact which I witnessed in 1797, about the latitude of 19 N. nearly midway between Africa and America, seems to countenance this periodical blindness. An ill-contrived experiment having been made to ascertain the temperature of the sea at a great depth, with a deep sea lead, and 300 fathoms of line fastened to a bottle, the line became entangled, and was supposed to have floated, for on hauling up, a fish of the scomber family was found encumbered in a coil, but remarkable, because although he was sound and firm, both eyes were nearly closed from the nose backward by a white film or nictitating membrane, and the jaws were fixed close, so as to be opened with great difficulty. A Malay seaman on board said it was not an uncommon occurrence in the East India Seas, and indicated the torpid period of the species, when they do not take the bait, and sink to depths beyond soundings. I doubt that any species of fish in a state of activity can exist without the occasional aid of atmospheric air. The account of soundings below 1000 fathoms may be doubted, though 2000 fathoms of line might be out.—C. H. S.

Pelagian fish, though many species are gregarious, are not so clearly migratory as the foregoing. They, as the name imports, are residents in the high seas, and among them the scomberoid family, and particularly the genera istiophorus, xiphias, pelamis, temnodon, and thynnus, certainly frequent the superior strata [2] of the waters, and the two last mentioned, with their congeners, have partial migrations to the deep soundings of the west coast of Africa, into the Mediterranean and the China seas. Similar kinds of travels are undertaken by some of the exoceti; but doradoes or coryphænæ, the greater species of squali and cephalopteri, come in shore from accidental causes only, or in pursuit of the migratory armies. There is, however, no reason to believe, that in all their wanderings, any of these species are ever induced to descend to very great depths for a considerable time; but finding their food principally near or on the surface of the sea, they constantly remain near it, and may be seen occasionally hunting their prey even in the night. The naucrates and parasitical echeneis attend the greater cartilaginous genera, but it may be doubted whether other acanthopterygian tribes besides those already mentioned are strictly pelagian, and venture in the high seas many degrees from soundings. There are, it is true, several percoides, such as polyprion, and other genera, whose species are common to the shores of both hemispheres, and pass round Africa even into the Red Sea, and eastward perhaps beyond the coasts of Ceylon; but in the latter case they are probably coasters, and in the former they make their passage across the Atlantic by attending the sea-weed.

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[1] It is perhaps necessary to qualify this observation by remarking, that in warmer seas, and particularly in the tropical waters, several of the sedentary species may spawn several fathoms lower down. Yet almost all the tropical percoids deposit their ova about the coral rocks, much nearer the surface, as I have personally ascertained, about Port Royal Keys in Jamaica, and the coral reefs of the Caribbean Sea.—C. H. S.

[2] With the exception of the common mackerel, I have found all fish possessed of brilliant colours, and particularly red tints, to be habitually superficial, though very often they reside in the offings, where there is deep water. The seas with corals, which reflect the sun to a great depth, have constantly the greatest variety of species possessed of brilliant colours.—C. H. S.

It would be certainly assuming too much, to assert that, the truly pelagian fish excepted, no other species cross the ocean without the aid of those aquatic plants known by the vulgar name of the gulf weed, and among which the fucus natans, L. is probably the most conspicuous; but certain it is, that numerous gelatinous animals, small mollusca, scyllæa, and pelagic crabs, and the fry of different species of fish, harbour in this weed wherever it is taken up and examined. In steering towards the equator, it is usually first observed in fields and islands on the surface of the sea south of Madeira, and if we take this place for a point of departure, the trade winds convey it along with the current towards the north point of South America, whence a part is drawn into the Caribbean Sea, and Gulf of Mexico; after sweeping round these shores, it escapes again by the straits of the Gulf of Florida in a north-eastern direction with the stream, till the north-westerly winds and the arctic currents conjointly carry the weed eastward towards the Azores, from whence tropical evaporation draws it again southward to recommence the same gyration[1]. There is a similarly revolving current south of the equator, bearing the same kind of marine vegetation, and its concomitant inhabitants, but much more scattered, and reverting only in part towards the Cape of Good Hope, while the rest may reach entirely across the Indian Ocean, float alternately in the direction of the monsoons, or passing up the straits of the great islands of southern Asia, ascend till it congregates in the Japan Seas, where it has been observed to be particularly abundant. The Pacific has besides a great variety of other vegetable substances floating with the winds and currents; and beneath the equatorial line, in the region of frequent calms, vast streaks of peculiar colours often occupy spaces of more than a degree in longitude, indicating the surface of the sea to be covered with fish-spawn, and with infinite multitudes of medusæ and other free acalephæ, who have in those latitudes the centre of their existence. It may perhaps be worth remarking, that a chain of soundings is *said* to exist from continent to continent, near the equator.

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[1] Doctor Leach in MSS. enumerates several genera of malacostraca, &c. which Mr. Cranch took from these plants. Some of them are now published in the transactions of the Plymouth Society. I have myself found among other species an albula (Plumieri ?) and small serrani in the fucus natans off Trinidad. It was no doubt an immense field of the weed which impeded the progress of the Carthaginians on their expedition of discovery along the west coast of Africa, and the same plant also caused great uneasiness to the crews of Columbus's ships.—C. H. S.

Although the number of species clearly proved to visit both continents be not considerable, and fewer reach the Indian Ocean, still along with the floating weed species of serranus, rypticus, polyprion, trichiurus, belone, hemiramphus, &c. are common to the soundings of America, as well as Africa and Europe; and tribes of caranx, seriolus, scomber esox, and sphyræna, are seen not alone about these plants, but in still greater numbers in the track of the medusæ, where they as well as the troops of pelamis, thynnus, and temnodon, are accused of acquiring the noxious property which poisons the unwary seaman, and is known by the name of ichthic venom.

Towards the polar circles, but more particularly in the temperate latitudes of both hemispheres, there are periodical extensions of residence among the coasting species, regulated by the progress of the sun towards either side of the tropics. It is particularly observable where a great current sets from a warm towards a cold latitude; as in the gulf stream of Florida, whose tepid waters only partially depositing their alluvials on the Bahamas, rush onward, till they are checked by the counter current of the St. Lawrence, and the icy influx from the pole, and form the sandy precipitation of the banks of Newfoundland. The tropical fish carried along in this current without sensible diminution of temperature, divide nevertheless at the first mentioned deposit, where the coasting species and those which frequent soundings remain, while the truly pelagic, thynnus, caranx, temnodon, the squali, and even exocetus, proceed to the second, where they are met by the polar colonies of gadi and resident pleuronectes[1]. Thus also with the summer season the species of mugil, thynnus, and exocetus, pass up the Mediterranean, and return in autumn, at the same time that deep water percoid, sparoid, serrani, lampris, &c. aided by that portion of current which ascends northward off the coast of Spain, and sweeps round the Bay of Biscay, range along the soundings, not unfrequently as far as the islands in the British Channel. Some of the same species are found during the opposite season penetrating south to beyond the Cape of Good Hope, where they are turned back by the south-east monsoon, and the receding sun. On the east coast of South America the same species occur, no doubt brought by similar means from the west of Africa; but here the general direction of the land being to the westward of south, the southern part of the tropical current continues along the coast to a much higher latitude, before the effect of the south-western winds operate fully upon it; hence the tropical species of fish, at least during the antarctic summer, spread further south, and possibly are not completely repelled until the cold and storms about the Falkland and Magellanic Straits effect that purpose, in latitudes where the gadoid species of the south come to meet them, somewhat in the same manner as occurs on the arctic side of the shores of Newfoundland.

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[1] I have witnessed the taking of a flying fish on the 23d September, 1816, on the same day that we passed two icebergs, at no great distance from the island of Sable, near Halifax. The summer progress of the

In the warm seas of the tropics, and particularly in the Pacific and Indian Oceans, certain genera belong so constantly to the deep water, that they can barely be considered as seeking soundings; such are chætodons, balistes, and acanthuri, delighting much to roam about the vertical coral reefs and islands which abound in those latitudes, and often have more than one hundred fathoms of water on their edge.

tropical fish by this current may also induce an occasional phaeton to pursue them. I have figured the variety of p. æthereus in this work from one shot off New York. The specimen may be of a distinct species.—C. H. S.

Where these reefs shelve into basins and creeks of less depth, acanthopterygians of the sparoid, percoid, scienoid, and, labroid families are detected, and further out in depths exceeding one hundred fathoms the large-eyed species of priacanthus, chatoessus, pomatomus, etelis, cheilodipterus, megalops, &c. keep mostly deep below the surface, as indeed their inferior powers of fin sufficiently indicate; and above them, pirabebes, prionotes, and pteroids, or flying gurnards, and flying scorpions, rise out of the water, and escape from their enemies much in the same manner as is practised by flying fish.

Where shoaling waters have sandy bottoms, and form valleys, from sixty fathoms upwards, coffered species and expansile diodons are frequent; and where banks of about forty fathoms occur, particularly in temperate regions, many species are met of those families whose heavy bony heads require ventral fins beneath the throat, and indicate that their habitual position in the deep is with the head downwards, grovelling for bivalves; here also we naturally find their particular enemies and the deep water flat fish forming assemblages of all the gadoid families, together with chimæras, bogmari, anarrhicas, hippoglossi, and the ground sharks, dog-fish, and other squali; who only forsake this kind of prey to follow the columns of clupeæ which in their seasons are seen advancing above these plains, coming from the polar seas to fulfil their destinies along the coasts and estuaries of more genial climates. From more sunny seas other columns come also to the temperate latitudes, such as the genera of scomber and mugil; but the former make a longer stay, and come closer in with the shore, while the latter are fish of passage, accessible only for a short time. In similar depths, and in less, but where the ground is often found to be more broken, other species of caranx, with centronotus, lepidolepes, trigla, centropomus, holocentrus, scarus, bodianus, and tetragonurus, reside; where the ground shoals still more, and offers soft muddy bottoms, we find the favourite region of stationary fishes, those who with their broad fins, rather fly than swim, are mostly destitute of air-bladders, and by nature burrow beneath the soil, such as all the rays and pleuronectes, congers, lophii, cepolæ, pteracles, and on firmer bottoms, cyclopteri, blennies, zei, and ammodytes. Within twenty-five fathoms water, where the power of the sun and the actions of the tides begin to admit the growth of submarine vegetation, where algæ, caulineæ, ulvæ, confervæ, and zoophytes, support numerous minute animals, the genera, ophidium, stromateus, muræna, uranoscopus, trachinus, scorpæna, peristedion, labrus, sparus, labrax, lutjanus, esox, murenophis, &c. chiefly resort; and more in shore among the tide rocks, naked or covered with weeds, are syngnathi, centrisci, smaller blennii, gobii, batrachi, and notopteri: among the stony and sandy flats of similar depth are met lepadogastri, callyonini, lepidopides, gymnetri, osmeri, scomberesoces, argentinæ, and atherinæ. These, with small pleuronectes, and the fry of many others, frequent the brackish waters of estuaries, and the young fish descend only into deeper seas when they are sufficiently strong to separate from the clouds of conglomerated thousands, which are constantly seen hovering about sandy shoals in tropical waters[1].

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[1] The authorities for the above general view, were drawn, 1. From personal researches on the West Coast of Africa, on the East Coast of South America, Trinidad, St. Lucia, Dominica, Curacoa, Jamaica, Honduras Bay, Golfo Dolce, the Gulf Stream, the Coast of the United States, Estuary of St. Lawrence, Strait of Belleisle, Coast of Halifax, and Bank of Newfoundland, the British Channel, and Coast of Provence in the Mediterranean. 2. From notes and inquiries obtained from our naval surveying officers in the bight of Benin, round the Cape of Good Hope, Straits of Madagascar, Red Sea, Nicobar Islands, New Holland, China Seas, River Plata, Straits of Magellan, Cape Horn, Valparaiso, Callao, California, West Coast of Ireland and Scotland. 3. From Risso, Ichthyology of Nice, and other authors. I ought to name also Peter Restive, an intelli-

In fresh waters, lakes, mountain streams, rivers, and marshes, we meet with periodical visitants from the sea, and permanent tribes who have but few representatives in salt water. Among the first are sturiones, salmones, many percoides, atherinæ, and even pleuronectes, in the second series nearly the whole cyprinoid and siluroid families, other salmones and esoces, lobites, loricaria, petromyzons, &c. Some of these are destined to reside in elevated lakes, others have the power of ascending cataracts and waterfalls of a most formidable nature, and there are species which can quit the water, and prowl through meadows, passing from one pool to another without hesitation. The facility of living in atmospheric air for many hours, is indeed conspicuous in a small species of the Indian ocean allied to our fishing frog or angler, it is chironectes commersonii which runs about, and is even said to be susceptible of some kind of education. Air is indeed necessary perhaps to every kind of fish, and particularly when the atmosphere is warm, most of our lacustrine species sport on the surface for no other purpose. But in high latitudes the fresh water species have almost invariably a power of surviving exclusion from air when accompanied with cold, such as occurs periodically, when ice covers the waters, and gradually increases, till in some places the fish are nearly or entirely inclosed in it. When the frost sets in they at first decline the bait, and come to air holes cut in the ice, but rarely; as the cold increases, it is found useless to attempt to fish; for they sink in the deepest water, and become torpid until the approach of spring, when they are again eager to bite at air holes, cut for that purpose. In the St. Lawrence, however, which is seldom without some natural openings

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gent Provençal fisherman, who spent his youth on the Mediterranean, and for many years of his after life was settled between Old Harbour and Port Royal, Jamaica; one who was thoroughly acquainted with the whole fishing and trading concerns along the Spanish main, and the Islands.—C. H. S.

through the ice, the fish are more lively, and are sometimes struck by the Indians; and, it is asserted that, during hard frosts, when drawn from beneath it, they freeze into a solid mass of ice in a moment, and are almost as fragile; yet that they will revive even after many hours, if they are carefully placed in water. Experiments tried about New York on this subject have not been crowned with success, because it was believed the frost, which was to suspend animation, was not sufficiently intense. That ice in the stomach even of a reptile will not destroy life, is admitted in the United States, where rattle-snakes are not unfrequently found in the winter, torpid, and with their food undigested and completely frozen within them, yet liable to become vivacious with the least increase of temperature; and digestion recommencing as if no suspension of the animal functions had interposed. These phenomena are therefore common to many species of fish, to several serpents, as well as to tritons.

But all these varieties of powers and habits are chiefly the result of conformation, and it would be vain to attempt to account for them, without first studying in detail the structure of all the parts of fish, the differences which distinguish this structure from that of other vertebrated animals, and the modifications it receives in the various families, genera and species. It is therefore necessary to form at least an abstract notion of the parts of fish, both with regard to external form and internal conformation: the bones, the muscles, the organs of the senses, of circulation, of reproduction, &c. must be examined, before a competent acquaintance can be obtained of the animal organization, modified as we find it in fishes.

EXTERIOR OF FISHES[1].

Fish are without a neck, and their tails are usually of equal thickness with the body at their insertion, giving them in general simple forms. The body may be rounded as in the diodon, cylindrical as in the eel, depressed as in rays, or compressed as in most species; the head may be larger than the body, as in the angler, or smaller than the body, as in many fishes. It may be round or variously shaped; obtuse as in cottus, more or less lengthened as we see it in fistularia and centriscus. Both jaws may be prolonged as in orphia, or the inferior jaw alone may be lengthened as in hemiramphus, or the upper one prolonged above the mouth as in rays, sharks, and xiphias. The mouth may open below as in rays, or at the point of the snout, as in most fishes, or upwards, as it is found in uranoscopus. It may be more or less wide, from a small opening, such as centriscus presents, to an enormous gape, like that of the angler.

Exteriorly only two organs of sense are visible, the orifices of the nostrils and the eyes; but the first may be simple, as in rays and sharks, or double, as in most osseous fishes; and they may be placed further from or nearer to the eyes, the jaws, or the point of the snout; the eyes vary exceedingly in size, according to the species, and may be altogether concealed beneath the skin, as in apterichti. They may be directed laterally as occurs in most species, be raised or turn altogether towards the sky. The whole genus pleuronectes has these organs on one side, both eyes being placed on the right or on the left side of the head.

One family of fishes only, (the chondropterygians,) has the external border of the branchiæ fixed to the skin, and as many openings for the escape of water as there are intervals between the branchiæ; but all other fish have these branchiæ free on their external edge, and the water which has entered the mouth is ejected by a single opening or gill on each side; the gills are of different sizes, and open more or less remotely. Herrings have them large, and nearly encircling the head, in eels they are small, and placed far back; there are even some species of this family, which have only a single aperture for both gills. The operculum or gill plate, whose pulsations serve in respiration, may vary in figure and size; the termination of the membrane beneath may be united, in toto or in part, with that from the other side, or with the part next the shoulder. The number of rays supporting it may be more or less considerable. Sometimes, as in diodon, &c. a great part of this organ may be concealed by the skin, or altogether wanting as in all the fish provided with several orifices.

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[1] Cuv. Hist. des Poiss. vol. i. p. 288. et sequent.

Some of the fins are vertical, constituting a kind of keel and rudder: those on the back are named *dorsals*, behind the vent and under the tail *anals*, and at the extremity of the tail they form *caudals*. They differ in number, size, and the nature of the rays which support them, being sometimes spinous, and at others soft and articulated. Other fins are double or form pairs, and represent the four members of other classes of animals. Those corresponding to arms or wings are the *pectorals*, and are invariably fixed behind the gills; but those which occupy the place of feet, named *ventrals*, may be placed either forward beneath the throat, or more or less backwards to the commencement of the tail; both may differ in size, in the quality of the rays, in their number and structure, one or both pairs may be wanting. Eels, for example, have no ventrals, murænæ, have neither ventrals nor pectorals; and apterichti have no fins at all.

Malacopterygians are such fish as have all their fins supported by articulated rays, and acanthopterygians those whose fins are in part simple and spinous; but some malacopterygian fish, as for example, carps and siluri, have the articulations of some rays soldered together, so as to appear spinous.

The anus may be placed far behind the ventral fins, near them or approach them forward, and where the ventrals are wanting, it may open under the throat, as occurs in the sternarchus. All the differences here enumerated result from the structure of the fish; but there are others of a more superficial nature.

The jaws may have teeth of every kind, and these may be found in all parts of the mouth, and even in the throat; the lips may be furnished with barbels or beards, of different substances, numbers, and lengths. There may be fleshy filaments hanging from the skin, as in scorpænæ; some rays of fins may be separated, and susceptible of independent motion, either from the ventral fins as in lophius, or from the pectorals as in the gurnard.

Finally, the nature of the teguments, on the body, head, or fins, may vary. A fish may be naked, scaly, spinous, or plated, in all or in several of his parts; the scales or plates may offer endless differences in size, order, shape, and inequalities of surface. The same differences may occur in the teguments of the head. The line which is marked on the sides of fish, consisting in a succession of pores or of small tubes in the scales, may be more or less prominent, and even rugous or plated; it may also be nearer the back, more or less arched, straight, or interrupted. If to these considerations we superadd colour, variously distributed, differing in tints and the differences of size and weight observable in fish, we have the general data which constitute the notions we ought to have relative to this great class of beings.

In the following abstract of the Baron's anatomical descriptions we fear that the necessity of abbreviating will render the text obscure, unless strict attention be paid to the references in the plates. It may be proper also to add that, to avoid being misunderstood, where so many different names have been given to the same objects, the nomenclature and terminology of the author have been retained in the version even at the risk of using gallicisms.

ON THE TEXTURE OF THE BONES OF FISH[1].

The skeletons of fish are either bony, fibro-cartilaginous, or really cartilaginous; the last-mentioned, constitute the chondropterygian fish, who have in the whole of their framework; in their branchiæ, the external border of which is fastened to the skin, allowing water to escape by means of narrow and multiplied openings; as well as in other marked details of organization, distinctions which obviously separate them from all other fishes. They are without real bones, the hard parts being internally only cartilage, homogeneous, and semi-transparent; merely covered on the surface in rays and sharks, by small opake and calcareous granules, closely placed together; but lampreys are without this superficial addition, and in ammocetes, the remaining one, the skeleton is in a really membranous state. Sturgeon and chimæræ have their spines soft like lampreys, but the first-mentioned genus is possessed of many bones of the head and shoulder, of which the blade on the surface is completely hardened and ossified.

Other fishes differ in this respect, simply in the relative hardness of the parts of their skeletons, and the fibro-cartilaginous genera have been associated without cause with the chondropterygians. Mixed with the cartilage which constitutes the basis of their bones, the calcareous matter or phosphate of lime is disposed in fibres and layers, in the same manner as in fishes with hard bones, but less abundantly and the texture of the bones does not become quite so hard and homogeneous as in several of the osseous species. Thus for example, in tetrodon mola the bones appear like scattered fibres within membranes. In the lophius piscatorius, or the angler, they are nearly as soft; but other tetrodons and diodons, balistes and ostracions have more dense bones, and some of them are little less so than in ordinary fishes. Artedi and Linnæus have refused them opercula and branchiostegous rays against the fact; balistes have even ribs, their only osteological difference arises from the granulations on their jaws; and syngnathi have regular bony jaws, but they want ribs and branchiostegous rays. Most osseous fishes have their bones as hard or harder than other animals; some are so homogeneous and solid as to show no pores or fibres, and appear to the eye of a vitreous texture.

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[1] Cuv. Hist. des Pois. chap. iii.

Neither osseous nor cartilaginous fishes have either epiphyses on their bones, or medullary canal within them; but there are some, like the trout, the tissue of whose bones is penetrated by an oily juice; in others, like the dory, where the internal part of certain bones continues cartilaginous, while the surface is completely ossified; and finally, some, while the rest of the skeleton becomes very hard, retain bones constantly in a state of cartilage, as those of the head of the pike.

ARTICULATION OF THE BONES OF FISHES.

The articulations of the bones of fishes display the same variations as in other animals; but the arthrodiæ and ginglymi, that is, the articulations which admit determined motions, either in one or more directions, are less abundant, because their members are not required to execute such a great variety of motions. Thus by means of a ginglymus, the under jaw and operculum are attached to the pteropalatine apparatus, and that apparatus to the cranium. There are others in the articulation of the rays of the dorsal and anal fins with the interosseous bones, and in that of the first ray of the pectorals with the bone corresponding to the radius. They have even two kinds of determinate movements by articulation, which do not occur in other classes of animals; that, obtained by means of two links or annulations joined together as it were of a chain, and that which at the will of the fish is either very moveable or quite fixed. Both occur in the structure of siluri. The articulations for determined movements offer ligaments, cartilage on the surface of the bone, and a synovial liquor as in animals of the superior classes. The articulation of the joints of the vertebræ is effected by means of a fibro-cartilaginous substance, which passes through them, and which, in some cases, as in sturgeon and lamprey, assumes the form of a cord; and it is also by similar fibro-cartilaginous substances that the several pieces of the opercula, of the branchial apparatus, of the humeral, brachial, and carpal bones, and of the pelvis, are connected, and that the last-mentioned are fastened to those of the shoulder.

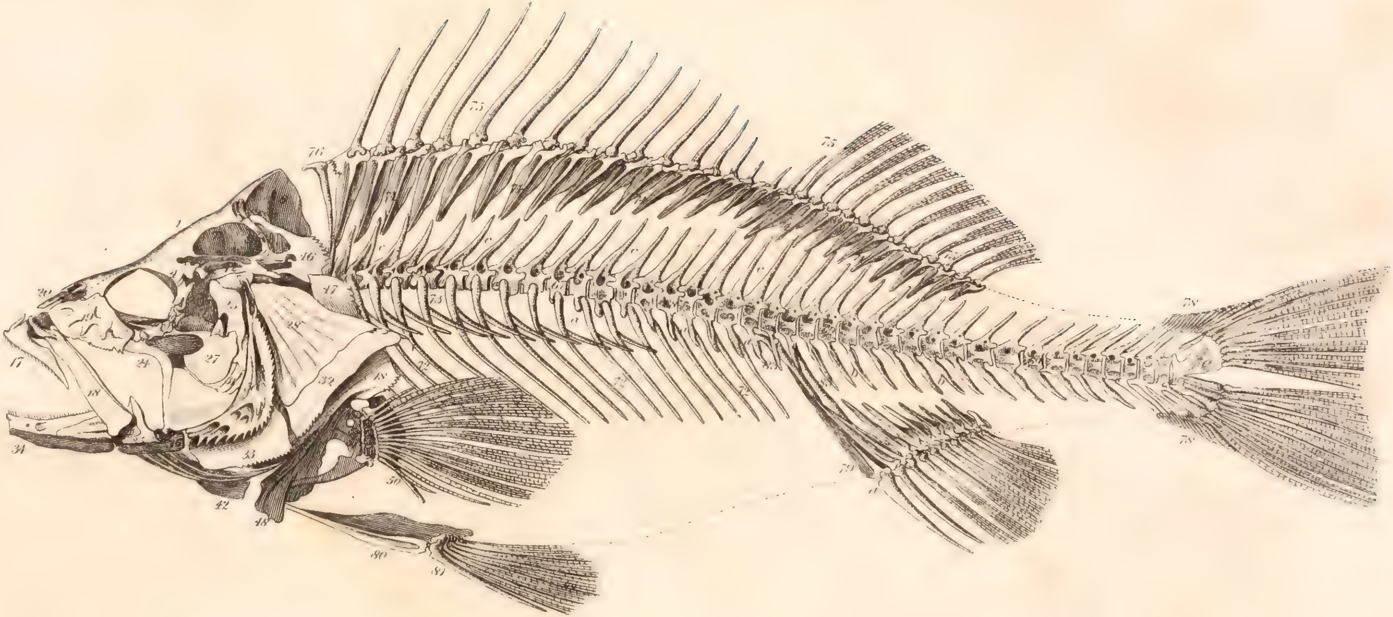
The chemical composition of these bones presents an organic base penetrated by earthy matter. The earthy matter consists of phosphate of lime and of magnesia with oxide of iron, which may be supposed to be united to phosphoric acid; there is also some sub-carbonate of lime. As for the animal matter, the part azotized constitutes the base of cartilage; the rest fatty, forming an oil that pervades it. The cartilage of the bones of fish differs from that of mammiferæ and birds, since it does not afford gelatine when boiled. The oil is principally composed of oleine, slightly impregnated with an odorous principle, and a yellowish colouring substance. This oil is readily convertible into soap, and then produces oleic acid, glycerine, and a minute portion of margaric acid.

The skeleton of osseous fishes in general is composed of the head; of the respiratory apparatus, having always a considerable bony development; of the trunk embracing both body and tail; and of the members which are the pectoral and ventral fins; the vertical fins, or those of the back, anus, and tail, may be regarded as belonging to the trunk. In the head may be distinguished the cranium, the maxillæ, the bones beneath the cranium, and behind the maxillæ, serving to suspend and move them; the bones of the opercula, those surrounding the nostril, the eye, and temples, or those which cover a part of the cheeks. The respiratory apparatus contains the os hyoides and its appendices, that is, the branchiostegous rays, and the arches which support the branchiæ, and the different pieces and arches which are connected with them, and perform the offices of larynx and trachea; and finally, the bones at the entrance of the pharynx, forming a kind of secondary jaws.

The trunk is composed of the vertebræ of the back and tail (for there is no real neck nor sacrum) of the ribs, of the interspinal bones which form the root of the dorsal and anal fins, and of the rays of those fins, including also the caudal. These rays, whether they be branched and articulated, or simply spinous, may be always divided lengthways into halves. Fish seldom have a true sternum, and where it exists, pieces almost external compose it, and unite the inferior extremities of the ribs.

The anterior extremity or pectoral fin contains the shoulder, the bony semi-circle composed of several pieces, and suspended above from the cranium on the spine, and below, united to the corresponding bone of the other side. Two bones comparable to the cubitus and radius bear upon their edge a row of little bones, apparently the representatives of the carpal series, supporting all the rays of the pectoral fin, except the foremost, which is articulated with the radial bone. The posterior extremity varies in position, and is composed of four bones, the largest of which, and also the most constant, being always before the anus and genital orifices, may be viewed as a kind of pubis, and carry upon part of their posterior edge the rays of the fin without any intermediate small bones that could be compared to the femur, tibia, peroneum, or tarsal bone.

The cranium of fishes is in general more distinct and detached from the face, than in other vertebrated animals. In most species the intermaxillary and maxillary bones move upon the cranium by means of *diarthroses;* can move independently of each other, and even independently of the palatino-pterygoïdian, and tympanal system, which has its own movements. This last-mentioned system, as is also the case with birds and reptiles, forms a plate more or less vertical, articulated by its posterior superior angle to the side of the cranium behind the orbit, and anteriorly to the anterior part of the cranium at the side of the vomer; this anterior extremity partly supports the maxillary bone; the posterior inferior angle gives the surface for the articulation of the lower jaw. The face has two structures unknown in other classes of animals; the apparatus of suborbitary bones, forming a chain from the anterior frontal to the posterior, and completing below the shrine of the orbit, at a point to which the maxillary and jugal do not extend; and the apparatus of opercular pieces, which adheres to the posterior border of the palatine and pterygoïdian-tympanal system, protects the branchiæ, and opens or shuts according to the movement of the water serving in respiration. Between these four structures, the maxillary, suborbitary, pterygo-tympanic, and opercular, is situated the cerebral cavity or cranium, containing as usual, the nose and eye in external cavities, the labyrinth of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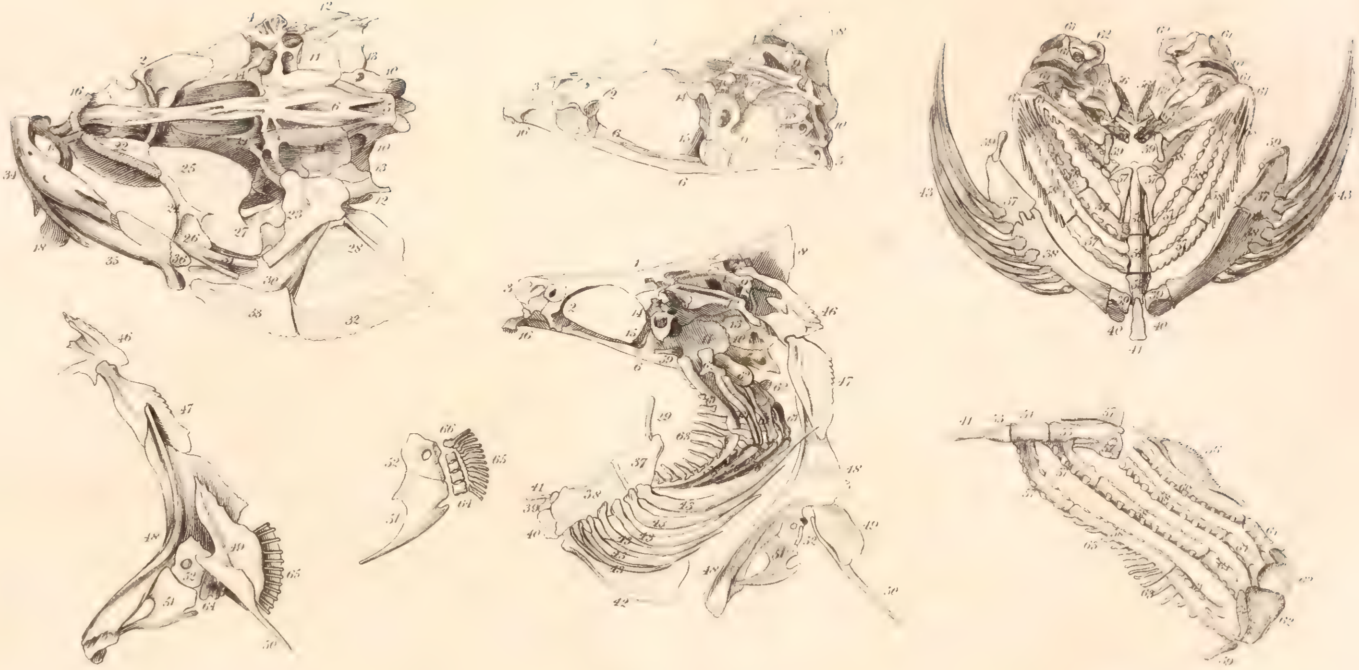
Osteology of the Perch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Osteology of the Perch.

the ear in an internal and lateral cavity, and the encephalon in the great cavity in the middle: it is composed of pieces firmly united by sutures.

In the cranium of the perch, serving as a type of all the acanthopterygians, we find on the superior aspect the *principal frontal* (No. 1); the *anterior frontals* (No. 2) form the anterior surface pillar where the olfactory nerves pass, the *ethmoidal* (No. 3) constituting a vertical partition; the *posterior frontal* (No. 4) is the after pillar of the orbit, and aids in the articulation of the *temporal* (No. 23): the axis of the inferior face is occupied by the *basilary* (No. 5), and the *sphenoid* (No. 6), the *parietals* (No. 7), are easily known behind the frontals; they are usually separated by an odd bone (No. 8), which we may name *interparietal.* On the sides of it are two pairs of bones, the *external occipital* (No. 9), and *occipital lateral* (No. 10); this last pair often forms on the inside a kind of floor above the auditory sacks containing the auricular stones. The *inferior occipital*, or *basilary* (No. 5), occupies its proper place, and its articulating surface, shaped like a hollow cone, attaches the head to the first vertebra, but two other small surfaces, which in many fish assist in this attachment, belong to the lateral occipital (No. 10). On each side of the sphenoid, and before the lateral occipital and inferior occipital, rises the *great ala* or *temporal ala* (No. 11), always united by suture to the *posterior frontal* (No. 4); at the lateral posterior, and superior angle of the cranium, there are always on each side between several of the above-named bones, two others, the first is the *mastoidean* (No. 12); the second, large in gadi, but small in acanthopterygians, is the rock or rupes (No. 13). In front of the great ala, and fixed to it is the *orbitary ala* (No. 14); beneath and before them is a single bone usually planted into the sphenoid: it is the *anterior sphenoid* (No. 15). Two bones form the anterior extremity of the cranium: the one above is the *ethmoidal* (No. 3), the other beneath the *vomer* (No. 16). The external part of the cranium usually terminates at the back of its occiput into five points, sometimes prolonged into crests; that in the middle is single, and named *medial*, and is connected by the cervical ligament with the spinous epiphysis of the dorsal vertebræ; the second are a pair, the *intermedial*; the third also a pair, are the *external*, and belong to the mastoidean (No. 12), beneath which, in a channel formed under the mastoidean and frontal, the temporal and palatine apparatus is articulated.

At the back of the encephalic box a sinus opens, which is entirely surrounded by the occipital laterals, and forms the *posterior fossa*. Between the orbitary alæ, the frontals and the bifurcation of the anterior sphenoid, there is a space which forms the opening of the *anterior fossa*, usually entirely membranous. The *medial fossa* is limited forward by a transverse process of the orbitary ala, and behind by another which extends over the internal face of the great ala and posterior frontal. The two uniting behind and at the bottom of this, there is in general a hole leading to a canal, which terminates in the form of a funnel in the basilary, and lodges the pituitary gland.

Between the medial and posterior fossæ are the cavities of the ear, consisting of two great hollows beneath the cavity of the brain, and of divers depressions occupying the lateral posterior angle of the cranium. The cranium has besides some openings or cavities, which, in the recent state, are generally closed by cartilages or by membranes.

The upper jaw. Salmon and trout offer the clearest examples of the *intermaxillary* and *maxillary* bones. In acanthopterygians the *intermaxillary* (No. 17), forms nearly the whole of the border of the upper jaw, and is moved by an ascending apophysis, which slides before the anterior extremity of the cranium. The *maxillary* (No. 18), is parallel to the intermaxillary, forming the labial bone, and articulated with it (No. 17), as also with the salient surface of the vomer (No. 16), and with a slightly bent apophysis of the palatine bone (No. 22). The form of the intermaxillaries in general determines the shape of the snout of fishes, whether depressed, rounded, pointed, or prolonged; and the length of their ascending pedicles gives the power of protracting the mouth.

The nasal, suborbitary, and supra-temporal bones, are the most variable of all in the osteology of fishes. The *first suborbitary* (No. 19), is articulated to a surface of the external lower apophysis of the anterior frontal, and forms the outer border of the nostril, while the internal border is formed by the *nasal* (No. 20), articulated above with the frontal (No. 1), and other bones. To the first suborbitary above-mentioned, are attached a chain of bones more or less enlarged and numerous (No. 19), ending at the posterior frontal (No. 4), having passed round the lower edge of the orbit: these are the bones which are so conspicuous on the plated cheeks of triglæ and scorpænæ. There exist in many instances another suite of small bones, the *supra-temporals* (No. 21), forming a chain towards the rear on each side, between the external and intermedial apophyses of the cranium, which cover the articulation of the *supra-scapular bone* (No. 46), with their two apophyses.

The palatine arch, or palatino-pterygoidean and temporal system is composed of seven bones on each side, including the *palatine* in front (No. 22), which is often armed with teeth, and reaching as far back as the temporal (No. 23). Behind the palatine are two bones; the one narrow, bent, and forming the external border, is the *transverse bone* (No. 24), the other broader, flat, and thin, occupying the central and internal part of this system, answers to the internal *pterygoidean* (No. 25); the first is attached to the *jugal*

(No. 26); above this, and behind the pterygoidean, is another broad, flat, and thin bone, named *tympanal* (No. 27), and above this the large *temporal* bone (No. 23), already noticed. This bone affords backwards a tubercle to articulate with the principal piece of the operculum (No. 28), and below furnishes an attachment for a bony stylus (No. 29), which bears the branch of the hyoid bone, and represents the styloid of mammiferæ. Behind these three pieces is placed lengthways the bone (No. 30), which constitutes the fixed border for the movements of the operculum, and which is therefore the *preoperculum.* But there is besides a long narrow bone (No. 31), between the intermediate flat bone and the preoperculum, sliding partly behind that which articulates with the lower jaw, and forming an angle with the styloid: this is named the *symplectic.*

The opercular bones consist of the *preoperculum* (No. 30), usually a right angled[1] bone, encompassing the posterior border and angle of the main blade of the palato-temporal, and belongs to it more than to the opercular apparatus. The serræ and spines, which often appear on the border and angle, being visible, are of great use in determining the characteristic distinctions of fishes. The *operculum*, properly so called, (No. 28), is placed behind the ascending border of the former bone, and moves upon it like a shutter within its case. The *suboperculum* (No. 32), is placed beneath the posterior and inferior border of the operculum; and before this, under the preoperculum, and behind the lower jaw, is the *interoperculum* (No. 33). This bone furnishes an attachment to the branch of the hyoid bone, at the point where it is itself joined to the styloid, which suspends it on the temporal bone; hence the opercular shutters cannot open or close without a corresponding movement of the hyoidean branches.

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[1] That is a bone bent at a right angle, so as to resemble the instrument used by carpenters, and termed *a square.*

The lower jaw is composed of two branches, uniting in front, and articulating behind by a hollow facet to the pulley which terminates the jugal (No. 26) at that end. These branches are in general only divisible into two bones, the *dental* (No. 34), supporting teeth upon its upper edge, and the *articular* (No. 35), where the articulating surface is found. They unite by means of a point of the second entering a socket of the first. There is often a third bone, the *angular* (No. 36), forming the posterior angle of the jaw, and sometimes a fourth, on the internal face of the articular, and corresponding with the opercular (No. 37) of reptiles. Thus the head of fish contains about sixty bones, and sometimes, in consequence of the subdivisions of the superior maxillary, several more.

The *hyoïd bone*, and branchiostegous rays, adhering to it by the membrane named also branchiostegous, complete the closing of the large aperture on each side of the head, to the shoulder: the hyoid placed as in the other classes of vertebrata, but attached to the temporal, is composed of two branches, each of five pieces; the *styloid* (No. 29), by which the apparatus is suspended to the temporal, two lateral pieces (No. 37 and 38) placed in succession, and forming the main part of the branch (No. 38), attaching itself to the interoperculum, and two small bones (No. 39 and 40) placed above each other at the anterior extremity of the branch, serving to join it with the corresponding piece. Before this junction is the *lingual* (No. 41), as in birds and reptiles, and beneath it, uniting the two branches, is a single bone, which by joining the symphyses of the humerals forms the *isthmus* (No. 42) which separates the two gills below. Thus the hyoid bones are twelve in number. The *rays* (No. 43) supporting the branchiostegous membrane, adhere by moveable articulations, and often by mere ligaments, to the inferior edge of the chief pieces of each branch. They vary in number exceedingly, from three in carps to above thirty in elops, but commonly there are seven, as in the common perch. Fish breathing only by means of the water which they force out at the neck after they have taken it in at the mouth, it passes between the branchiæ, which are formed like combs, usually four on each side, and composed of a great quantity of laminæ of a cartilaginous and membranous nature, thin, narrow, forked, and placed in regular files. These four branchiæ are supported by four pair of arches, adhering by their inferior extremities to the two sides of a chain of intermediate little bones, which is itself attached forward into the angle of the hyoid bone. These arches also ascend in a curve backward, and fix their other extremity by means of ligaments beneath the cranium. The little intermediate bones are a sort of continuance of the lingual bone; they are usually three (No. 53, 54, 55), and with the inferior pharyngeal (No. 56), give attachments to the hyoid and the arches. The first three arches are composed each of two pieces moving the one upon the other (No. 57 and 58); the fourth consists but of a single bone (No. 60). The superior portion (No. 61) is much shorter than the other, and is simple in all, excepting in the first pair, which, not having a pharyngeal bone to support, is usually suspended from the cranium by a small stylus (No. 59). The internal face of the arches is armed with teeth, or small plates, or cones, and in some there is a row of teeth externally on the first pair (No. 63).

The pharyngeal bones are placed at the entrance of the œsophagus, immediately behind the branchial apparatus, for the purpose of performing a second mastication, often more powerful than the first, and accordingly in different species they are armed with different kinds of teeth. There are usually two inferior, and six superior; the former (No. 56) are in general two triangular plates, serving as a floor to the pharynx; or they turn in part round the œsophagus, or form only one bone: the latter consisting of three pieces on each side (No. 62) under the last superior arches, are commonly in the form of a plate, and form the roof of the pharynx. The pharyngeal and branchial apparatus contain usually thirty-six principal pieces, independent of others smaller, arming the interior of the arches, which would amount to more than one hundred.

The vertebræ of fishes are distinguished by the conical hollow on each of their faces. The double hollow cones which are thus formed in the interval between two vertebræ, are filled by a soft membranous and gelatinous substance, which passes from one void to another by means of an opening through each vertebra, nearly always in the centre, and forms a kind of gelatinous chaplet through the whole. They have, as in other animals, in their superior part, and for the passage of the spinal marrow, an annular portion, above which there is generally a spinous process (*c. c. c.*), and before and behind its basis smaller processes, representing the articular processes in other vertebrated animals; but they are often incompletely soldered, and scarcely articulated. The vertebræ above the abdomen (No. 67, 67) have transverse processes (*a. a.*): those further back (No. 68, 68) have those transverse processes turned down and prolonged, often united below by joining pieces, and forming rings (No. 69, 69), protecting a kind of channel which contains the vessels. The vertebræ nearer the tail gradually shorten their processes, and the channel closes. The last united with the interspinous bones form the triangular surface placed vertically (No. 70), at the end of which the caudal rays (No. 71) are attached. The number, however, of vertebræ, their length, and other particularities, are infinitely varied. It will be sufficient to add, that their number is not always in proportion to the length of the fish.

The ribs (No. 72, 72) have in general only one head, and adhere to only one vertebra. They bear often in an appendant form, adhering to some part of their length, one or two styli (No. 73, 73), which are directed outwards, and penetrate between the fleshy parts. It is in this manner the fine bones are multiplied, such as we see them in herrings. The ribs, not being employed in respiration, are little moveable; in some cases they encircle the whole abdomen, others have scarcely rudiments of ribs, and there are a few which are totally deprived of them.

The vertical fins have each ray composed of an internal part, named *interspinous* (No. 74, 74), which penetrates into the fish between the great lateral muscles, and forms the fixed part; and of an external part (No. 75, 75), which is the fin itself. There are often *interspinous bones* (No. 76), which bear no rays, and sometimes others bearing more than one. The interspinous usually have their points directed between the spinous processes of the vertebræ. The vertical rays (No. 75, 75) articulate by a lax ginglymus, each upon its interspinous bonelet, which enables them to be raised or depressed at pleasure. Some of these rays are pointed bones named *spinous* rays; others are bony at the base, but the rest is composed of a number of small articulations, very often ramified into other branches: these are named *articulated*, *soft*, and *branched* rays. Those of the tail are always of this last description (No. 71), but at the root above and below there are small bones (No. 78, 78), diminishing in size towards the front, where no part of them remains except their solid base. There is in general one ray less on the inferior half of the tail fin. In a great number of fish, the first and often the second post abdominal vertebra (No. 83, 83) have large inferior spinous processes, to which a bone is joined (No. 79), extending to behind the anus, and thus forming the posterior boundary of the abdominal cavity. The foremost interspinous bones, both above and below in certain chætodons, are clavate. Some genera, chiefly scombri, have the spinous parts of the anterior dorsal without membrane, and more often still the posterior rays of the back and anal fins are separated, and form false fins. Many fish have no sternum. When found, it consists of a series of single bones, at which the ribs terminate, as may be seen in herrings and vomers.

The bones of the shoulder and arm are found immediately behind the orifice of the gills, and consist of a series forming a kind of frame, into which the operculum shuts when closed. The two series usually attached to the head above, and uniting together below, form an osseous belt, encircling the body: their inferior symphysis, united by ligaments with the tail of the hyoid bone (No. 42), assists it in forming the isthmus which separates the external opening of the gills beneath. This belt, as in eels, is sometimes free. When the series is complete, three bones are found in each half: the uppermost (No. 46) is forked, and is in part visible in the form of a large scale, often serrated at the opening of the gills; the next (No. 47) is sometimes wanting, and the third (No. 48), always the largest, terminates as above stated; a fourth and fifth bone (No. 51 and 52) adhere to the inner surface, above each other, each pierced or scolloped out. On the free side the pectoral fin is placed, by means of four or five intermediate bonelets (No. 53) seated between the two bones and the rays of the fin, with the exception of the first ray, which is connected with the superior bone (No. 52). These bonelets represent the carpal series, and if this opinion be admitted, the two other bones (No. 51 and 52) will be the ulna and radius; thus also the great bone of the girdle which supports the two others may be regarded as the humerus, and the first and second (No. 46 and 47) will represent the shoulder blade. Therefore these pieces will require the names of supra-scapular, scapular, humeral, ulnar or cubital, and radial.

There still remains a kind of stylus, usually of two pieces (No. 49 and 50), the upper of which, partially flattened, is suspended from the humerus (No. 48), adheres to its internal surface, and to its posterior superior border, apparently representing the coracoidian of the superior classes. There are some curious modifications of these bones in the genera siganus, seserinus, batrachus and cyprinus, while in anguilla, anarrhicas, and silurus they are totally wanting. On the external border of the ulna and radius (No. 51 and 52) are the flat bonelets, compared to the carpus (No. 64). They bear all the rays of the pectoral fin, except the first, which is planted on the radius (No. 52). The bones of the carpus, and not those of the arm or forearm, are prolonged in the genera lophius and batrachus, where also they differ in number, as they do likewise in polypterus. The bones of the posterior extremities of other classes are represented in fish by a single bone (No. 80), usually triangular and complicated, variously suspended, the ventral rays issuing from its posterior border. All the rays of the extremities are divided longitudinally, each into two parts. Excepting the external ray of the ventral in acanthopterygians, they are almost always articulated, and that exception is, as the name of the order imports, a spinous bone.

In this manner is formed the skeleton of osseous fishes, including many genera improperly classed with the cartilaginous division. Except as relates to vertebræ and rays of fins they have all nearly the same number of bones in their composition, notwithstanding the great difference of form they may present; but the chondropterygians, really cartilaginous in their structure, have a different skeleton, requiring some notice.

The pieces of the skeleton in rays and sharks have no fibrous tissue characteristic of bone. Their interior remains always cartilage, and their surface alone becomes hardened by the accumulation of small calcareous granules, which gives them a stippled appearance. Their cranium in form is similar to that of other fish, and nevertheless of only one inclosure, without sutures. Their face is very simple, with but two bones in the palato-temporal arch; the first descends from the cranium, at the articulation of the jaws; the other represents the upper jaw, and bears the teeth. The maxillary and intermaxillary are reduced to vestiges. The under jaw has also but one bone on each side (the articular), bearing the teeth; of the others, only one vestige is found concealed under the skin of the lip. They have no opercular apparatus, but the hyoidian and branchial structure is in great conformity with the same parts in osseous fish. Sharks have besides, opposite to the external attachment of each branchia, a slender bone, a true vestige of rib. The branchial system is placed further back than in osseous fishes, beneath the commencement of the spine, whence the humeral girdle is also further back. This girdle is in rays and sharks of one piece; in the former it attaches to long processes of the spine, and in the latter it is quite free. On the sides of this circle are the pectoral fins, attached by several pieces. The pelvis is similarly a single transverse piece, not articulated to the spine, but bearing on each side a blade to support the ventrals. In the spine several vertebræ are soldered together, and there are twice as many superior rings as vertebræ. The spinal ribs, if any, are usually very small, excepting in sturgeons.

This genus is also, as respects the branchiæ, intermediate between cartilaginous and osseous fishes. Several bones of the head and shoulder are hard as stone, but not fibrous, yet the spine is almost like that of lampreys.

THE MYOLOGY OF FISHES.

The spinal vertebræ, united by cartilages, are enabled to move upon each other with greater facility to the right and left, in one or more curves, alternately convex and concave, than vertically, where the superior and inferior spinous processes, more or less lengthened, interpose. It is therefore by alternately striking the water with the trunk and tail, that fish chiefly move forward, the pectoral fins operating as regulators, and the ventrals both like oars and feet; both pairs assist in ascending or descending, in which operation the swimming bladder, placed under the spine, is commonly the chief agent, being acted upon by the compression of the ribs or otherwise, as the intended motion may require. This purpose is effected by means of muscles, which in fish are, as in other vertebrated classes, composed of fleshy fibres, more or less red, and of tendinous fibres, white or silvery respectively, in similar positions.

The chief of these are the pair of great lateral muscles, extending from the head and shoulders to the base of the caudal fin, representing the three bundles of the sacro-spinal, in a very complicated form, but without indicating the distinctions of cervical, dorsal, and caudal, as in other animals. They are separated from each other by the spine and its processes, by the deep muscles of the interspinous bones, and by the abdominal cavity. Their fibres are transversely divided by aponeurotic bars, into as many successive strata as there are vertebræ. These when boiled offer the division in flakes observed in fishes. They are placed obliquely to the spine, in such a manner that their superior and inferior portions are directed the one forward and upward, the other forward and downward, while the centre parts form an arch with the convexity directed forward. The muscle is divisible into three bands lengthways. The upper appears to be the *spinous dorsal;* the middle, the *long dorsal*, representing that which in tailed mammifera is the *lateral lumbo-sub-caudal;* and the lower, the *inferior lumbo-sub-caudal*, together with the abdominal muscles. Upon the middle band is perceived a slight groove, containing mucous vessels, but it is not of any depth. In the flat or depressed genera of fish, these bands are horizontal, and parallel to each other. Towards the tail, the great lateral muscles form an aponeurosis, terminating in the shape of tendinous slips at the rays of the caudal fin; the whole apparatus producing flexibility in a lateral and multifarious direction.

Between the great laterals, on the back, and often also below, there are two slender muscles, attaching to the bases of the dorsals and anal, giving them motion, and to the fish a power of bending upwards or downwards, as much as its vertebræ will permit. In the tail are three kinds of muscles; some superficial, in the form of a fan, implanted on the aponeurosis of the great lateral; others passing from one ray to another, and placed between them; and deep muscles beneath both those, adhering to the end of the spine, and in particular to the triangularly compressed vertebræ, which forms its termination. The muscles proper to the dorsals and anal fin being uniformly disposed, are six in number to each ray, four deep and two superficial; the latter inserted one on each side, at the basis of the ray, and stretched transversely across the great laterals, adhere to the skin; the former almost entirely hid between the two great muscles of the body, are disposed so as to raise or depress the fin. Of the muscles of the shoulder, independent of the great laterals, there is often one passing from the lateral posterior part of the cranium to the anterior superior part of the humeral bone, affording a covering to the membrane which serves as diaphragm between the cavity of the gills and the general cavity of the body. The muscles of the pectoral fin are in two layers on each superficies, slightly crossing over each other, and terminating in tendinous slips among the rays; the superficial anterior coming from the humeral descends, the internal from the cubital bone ascends; and the reverse obtains at the back part of the fin. The bones of the pelvis are attached to the slender inferior muscles before noticed, and by transverse muscles in some species, where these bones are not united; but the ventral fins possess *levators* attached to the superior surface of the bones of the pelvis, and *depressors* to the inferior surface; forming two layers on each side, resembling those of the pectorals, and their serrated insertions between the rays having one externally to spread the fin.

The jaws are acted upon by one single mass of muscle, which closes them by drawing them together. It adheres to the whole external surface of the posterior part of the palato-temporal arch, with all its bones, including the anterior edge of the preoperculum; from its anterior edge two tendons united by aponeuroris proceed; that from the superior angle to the superior maxillary bone, the inferior to the lower jaw, behind the coronoid process. In cartilaginous genera, there is, however, considerable difference. The lower jaw, having no digastric muscle, is opened only by means of the simultaneous action of the muscles which pass from the shoulder to the hyoid, and thence to the jaw. This last muscle resembles the genio-hyoidean; but as in many species the lower jaw has the power of approximating its two branches, there is a muscle proper for that office, placed transversely in the angle which they form.

The muscles of the palato-tympanic arch are, 1st, one occupying the roof of the palate, consisting of transverse fibres passing from beneath a part of the sphenoid and great ala to the superior border and internal face of the arch, &c. It lowers, and brings the arches closer together, compressing the space of the branchial apparatus; 2d, there is often another depressor further back; 3d, the levator of the same arch rising behind the orbit, and inserted towards the summit of the temporal, is the opponent of the former, and widens the palatine arcade and the branchial space. Thus by the action of two articulations, the movement of respiration is kept up in the animal while life lasts.

The muscles of the operculum produce a movement similar to that of the palatine arches; they are placed behind it, one external is the levator, adhering to the external crest of the mastoidean, and serves to raise the gill; and the other internal, the compressor to close it, is fixed to the lateral inferior surface, where the great ala and petrous bone join it to the mastoidean. It is separated from the depressor of the palatine arch by the bundle of superior anterior muscles of the branchiæ. The sub-opercular and interopercular bones have no particular muscles; they move with the operculum, and with the palato-temporal arch; and the muscles which approximate the branches of the hyoid, and contract the branchiostegous membrane, assist also in bringing the palatine and opercular structures nearer together.

The principal muscle of the hyoid bone corresponds to the genio-hyoidean; it comes from the internal surface of the branch of the inferior jaw near the symphysis, is carried over the hyoidean branch, and inserted upon the first of its two great pieces. The two genio-hyoideans are often united by the transverse fibres; chiefly of their middle part. Moreover, the muscles placed between the branchiostegous rays likewise draw the branches together of the hyoid, and a part of the great lateral acts as a sterno-hyoidean. A layer of fibres lies usually along the internal face of the branchiostegous rays; some arise from the inside of the operculum, and pass over the rays, adhering by cellulosity, and forming a kind of purse round each branchial cavity. A pair of muscles often occurs, mutually crossing each other, from the inferior ray of a membrane to the anterior extremity of the opposite branch of the hyoid. They extend the membrane, and bring it nearer to that of the other side. There are besides small particular muscles on each ray; but not in all species.

The muscles of the branchial and pharyngeal apparatus may be divided into several groups; some suspending it to the cranium, others to the humeral bone, others to the hyoid, while some are proper to the organ itself, uniting its different parts together. One bundle is attached to the cranium, at that part of the great ala and petrous bone which is beneath the articular groove presented to the temporal by the posterior frontal, and the mastoidean. It is composed of two ranges of bands, four external, and two internal; the first inserted on the back of the four branchial arches, the second to the two pharyngeals. These muscles raise the apparatus and dilate the gills. Another bundle attached to the cranium behind the depressor of the operculum, and extending to the extremity of the mastoidean, consists of two bands, one anterior, which reaches the fourth arch, and the other posterior, which extends to the tissue of the pharynx. A third bundle consists of a considerable muscle, passing from the third superior pharyngeal, through the fibres of the pharynx, obliquely to the spine. There is a particular muscle attached to the superior part of the second arch, and to the side of the basis of the cranium. Three muscles act upon the apparatus by means of the inferior pharyngeal, to which they are attached; and between these muscles and their fellows of the opposite side the pericardium and heart of the fish are placed. The muscles proper to the apparatus are four oblique on each side, from the single chain of bonelets to the lower part of each arch; and also three superior transverse from the pharyngeal to the nearest part of the arch. There is besides one inferior, from one pharyngeal to the other.

We have thus far endeavoured to give a very epitomized view of the skeleton and muscles, not without fear that where so much is sacrificed to brevity, the subject may not be found sufficiently clear to those who have not made comparative anatomy a study; yet our limits compel us to be even more concise on the remainder of this part of the science.

THE BRAIN.

The brain of fishes is remarkably small in proportion to the bulk of the animal, the quantity of nerves arising out of it, and the size of the cavity that contains it. The space thus left vacant is often filled with a kind of soft cellulosity, or even with oil or fat. In young fish it is not so considerable as in adults; whence the inference is drawn, that the brain does not increase in bulk, in proportion to the enlargement of the cavity. The lobes of the encephalon are placed behind each other, often representing a kind of double chaplet; there are also tubercles, concealed within or beneath the great lobes. The cerebellum is placed transversely upon the medulla, and before it on the superior surface is seen a pair of lobes always hollow internally, before which there is found a second, and often a third pair of other lobes, generally solid. In the interior of the hollow lobes before the cerebellum, one or two pairs of tubercles are usually placed; and on the inferior surface of the same part, under the hollow lobes, there is another pair of protuberances, which we name the *inferior lobes*, having before them the *pituitary gland.* Behind the cerebellum are other lobes, differing in number and form, and without evident corresponding parts in the superior classes of animals; perhaps the nearest analogy is with the *olivary bodies*, than which, however, they occupy a higher situation. These we name *posterior lobes.* The relative size of the cerebellum is rather considerable, and often surpassing in volume the parts placed before it, and having either no lateral lobes, or only slight proeminences to indicate them. In the perch it resembles a reversed Phrygian cap; in the mackerel the point is turned forward; in the tunny it is spread so as to cover nearly the whole encephalon. In the chondropterygians the forms of the cerebellum are still more varied, and sometimes its surface is furrowed. The *hollow lobes* are oval, and their shell is distinctly divisible into two layers or tunics. The fibres of the external tunic are grayish, and run lengthways, ending mostly at the optic nerve; those of the internal are white and transverse, lining the vault of the common ventricle which these lobes contain. Upon the floor of this ventricle, are two or four tubercles of a grayish substance, and placed before the base of the cerebellum. The medulla oblongata is easily observed extending forward, sending its external fibres into the hollow lobes, and its internal into the anterior lobes. There is a commissure which unites the anterior parts of the base of the hollow lobes; and behind it, and before the four tubercles, opens the ventricle, corresponding to the third in the human brain, and leading to the infundibulum and the pituitary gland. By the sides of the infundibulum are the inferior lobes, usually without a ventricle. These furnish fibres to the optic nerve, and may therefore be regarded as the optic lobes in fishes. There is a further singularity in the brain of these animals, consisting in lobes placed behind the cerebellum, on the sides of the fourth ventricle, varying greatly in different species, and often very large, forming even five successive tumefactions.

The olfactive nerves issue from the anterior tubercles; they vary greatly in form and composition in different species. The optic nerves cross each other in front of the infundibulum, without forming any further communication than through the medium of cellular structure; that on the right passes to the left eye, that on the left to the right eye. Their medullary structure sometimes presents the appearance of a ribbon folded lengthways, so as to fill the tube of dura mater which contains it. The distribution of the nerves is remarkably alike in fishes and other animals of the superior classes, each pair always preserving the same destination. The first passes to the organ of smell; the second expands to form the retina of the eye; the third, fourth, and sixth are supplied to the muscles of the eye; each passing to the same as in mammalia and birds; that is the third nearly to all; the fourth to the superior oblique, and the sixth to the abductor muscle. The fifth pair passes out of the cranium by the opening of the great ala, and divides into several branches, one ophthalmic; another superior maxillary; a third inferior maxillary; a fourth pterygo-palatine; a fifth operculary; a sixth branch unites on the cranium with one of the eighth pair, and passes along the sides of the dorsal fins: sometimes it sends other branches also over the trunk towards the anal fin. The seventh pair of nerves belongs, as in other vertebrated animals, to the auditory apparatus; in the eighth pair we can fully appreciate the constancy of nature's plan in the distribution of each nerve: for the glossopharyngeal passes out of the cranium, and is distributed upon the first branchia, and about it, and passes to the tongue, where it radiates; *the par vagum* passing out at an opening of the lateral occipital bone, sends branches to the three latter branchiæ, and to the inferior pharyngeals; and the main nerve continues to the pharynx, and follows the œsophagus to the stomach, in its course sending off branches which spread over the diaphragm. Thus we have the same distribution, only modified by the respiratory organ being in a different situation from the corresponding viscus in other vertebrated animals. From the *par vagum* one or even two other nerves proceed, not analogous to any in other classes; the first passes to the extremity of the tail, and in many species, after giving off a superficial fibre, follows partly the lateral line, and passes through the lateral muscles, receiving from the spinal nerves several direct ramifications. But in other species this nerve is altogether superficial, without communication with the spinal nerve, or connected only by means of very slender threads; the second nerve of the par vagum joins a branch of the fifth pair, in order to constitute the dorsal nerve.

The last nerve of the cranium issues from the medulla oblongata behind the eighth pair; after giving a branch to the swimming bladder, it passes and spreads over the shoulder on the muscles of the pectoral fin, and is anastomosed with the first spinal nerve. The second spinal pair gives nerves to the internal muscles, and to the posterior part of the same pectoral fin. Those fishes whose pelvis is suspended from the humeral bones, whether their ventrals be before or behind the pectorals, receive the nerves allotted to them from the third and fourth spinal pairs: the third supplying the muscles attached to the pelvis, and the fourth principally the rays of these fins. The same arrangement obtains in jugular fishes, the nerves turning back to the throat to attain the fins: but in abdominals, the nerves supplying the ventrals, depart from pairs lower down; as for example, in carps, where they arise from the seventh and eighth spinal pairs.

Chondropterygian fishes are similarly supplied with nerves from the cranium, but those of the pectorals have a greater variety of origins.

EXTERNAL ORGANS OF THE SENSES.

The senses of smelling, seeing, and hearing, are given to fishes by means of organs, analogous to those of other classes, and placed in the same manner. The eye, situated in a cavity of the head, as already noticed, varies in size, direction, and position. In some these organs are directed towards the sky, and closely approximated, in others they are far apart, and directed even somewhat downwards; but the most extraordinary positions are those noticed in pleuronectes, where both are placed on the same side of the head, one above the other. In some species of the eel and silurine genera, they are so diminutive, as scarcely to be seen, in others, as is the case with priacanthi and pomatomi, they are of a diameter proportionably larger than in any other known animal. In general fish have large eyes, and in particular the pupil is very broad and open, such as we would expect it to be for creatures who require great powers of vision, in the deep where light penetrates scantily.

The eye has no real eyelids, the skin passing over it, mostly in a transparent form, to admit light, is occasionally opaque, as in the ceciliæ and gastero-branchi, and conceals the vestige of the eye altogether. It is without a fold upon the eyes of eels, but forms a kind of adipose doubling before and behind on those of mackerel and herrings. In sharks the fold is more moveable, and in diodon luna it is puckered round the eye, and inwardly furnished with fibres, forming a kind of sphincter, counteracted by others in a radiating direction.

The eye-ball is capable of little motion; as in man, it is furnished with six muscles, four direct and two oblique; but the superior oblique wants the pulley to change its direction as in quadrupeds, and the funnel shaped muscle is also wanting. The vacant space between the orbit, the muscles, and the eye-balls, is occupied by a soft cellulosity, replete with gelatinous fluid, but there is no lachrymal gland, or *puncta*, which, in truth, would be superfluous to animals whose eyes are constantly bathed by the element they inhabit. Rays and sharks have the eye-ball fixed upon a moveable cartilaginous pedicle. The anterior surface of the eye is generally plain, or but slightly convex, and the aqueous humour not abundant; the rest of the ball is more or less spherical, only sometimes irregular. The summit of the ball in rays is flat, forming it into a kind of quarter of a sphere. That of anableps is singularly formed; having two corneæ separated by an opaque line, and two pupils opening in the same iris, so that it appears double; but there is but one vitreous humour, one crystalline, and one retina. The crystalline of fishes is voluminous, leaving little space for the vitreous; the lens is very hard, and remains transparent even in spirits of wine. The ball has four or five tunics; the sclerotic or external tunic is thick, fibrous, and in most species supported by two cartilaginous pieces, wrapped in its texture, which often becomes ossified. Anteriorly the sclerotic opening surrounds the cornea; the cornea is lamellated as in other animals, the internal lamella being often coloured yellow or green. Internally a thin membrane of a golden or silver colour surrounds all the parts, and spreads even before the iris, producing that beautiful metallic effect generally visible in the eyes of fish.

The pupil is but rarely provided with the faculty of altering its diameter: rays and soles, however, have a singular production, shaped like a palm upon the superior border of the pupil, which can close the opening somewhat like a window blind; the posterior part of the iris consists of another membrane, extending over the whole inside of the eye, and usually, on the interior surface, coloured black. It can be divided into two layers; the internal, which is the true Ruyschian, and the external, properly a vascular and thicker substance, answering to the choroid. Between the last-mentioned membrane and the metallic coat which envelopes it, there is an apparatus solely found in osseous fishes, consisting of a band or roll variously twisted, and forming an irregular incomplete ring, encompassing the optic nerve, so as to represent a considerable crescent, sometimes divided into two parts, but always open at the inferior side. It is always very red, being composed of a tissue of blood vessels. The use of this organ is unknown; it is conjectured merely to be an erectile texture, and to have some influence in adapting the visual organ to different densities of medium and different distances.

From the above remarks on the spherical form of the crystalline, the immobility of the pupil, and the difficulty of changing the length of its axis, it may be assumed that the sight of fishes is very imperfect. The images upon their retina must appear confused, and it is therefore probable that they are not susceptible of receiving very precise impressions of forms of objects. It is nevertheless true that they perceive their prey even at some distance, by the eye alone, since artificial flies can deceive them.

The ear of fishes consists almost solely of the labyrinth; and even that is much less complicated than in quadrupeds or birds. There is no external ear, unless the small cavity slightly turned in a spiral direction, which is placed before the meatus externus in rays, and is entirely covered by the skin, deserves that name. Osseous fishes have no such cavity nor meatus; a few only, lepedoleprus, macrourus, and some mormyri, have openings in the cranium closed by the skin, and capable of communicating mediately with the labyrinth. Others like myripristes have the cranium open below, but covered by a membranous partition which adheres to the swim bladder; but these communications are very different from those which take place by the tympanum or by the eustachian tubes[1]. Fish are in fact deprived of both these organs, and of the bonelets appropriated to the tympanum. In most osseous fishes all the membranous labyrinth is suspended in a chamber of the cranium, formed by a lateral excavation in the great chamber of the encephalon. Of the bony labyrinth there remain no other vestiges than some osseous or membranous fræna, surrounded by semi-circular canals, and the cavity in the face of the cranium, above the basilary bone, containing the bag commonly appended to the vestibulum, filled with gelatinous liquid. In this, and in the vestibulum, there are usually several bonelets, or rather calcareous, or testaceous nodules, in osseous fishes, and resembling starch in chondropterygians, of such determined forms that the osseous species might be readily distinguished from each other by this criterion alone. Several genera, such as carp, cat-fish, loches, &c. have received a special apparatus, by which anatomists have surmised that the deficient organs of the ear are in a great measure supplied; but these form exceptions, and it may still be asserted, that fishes have not hearing sufficiently delicate to distinguish varieties of intonation. That sound produces concussions acting powerfully upon them without the perception of modulation is evident, and hence they are scared by thunder, and fishermen practise silence while engaged in casting their net; but still all that the hearing of even the best endowed species can claim, is that a few of them can be called together by a bell, a whistle, or, as the ancients assert, can be made to know their names.

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[1] The connection between the auditory apparatus and the swim bladder is very remarkable in several species of fresh water fish of the Ganges, and others from the salt water estuaries of its Delta.

The nostrils are not constructed in such a manner as to allow either air or water to traverse them in respiration. They consist of two excavations, formed towards the point of the snout, lined with a pituitary membrane, disposed in very regular folds; they are oblong, oval, or round, placed at the point of the head, on the sides, and sometimes on the upper surface of it. In the lamprey they are near the summit of the head, and unite to form a single opening; in squali and rays they are on the inferior side, near the angles of the mouth. Most if not all osseous fishes, have what is called double nostrils; that is, two openings on each side of the head, but the two form in reality but one cavity; the anterior orifice is often tubular, those of the angler are in the shape of mushrooms standing on pedicles; several congers have the posterior opening under the lip. According as the cavity is round or lengthened, the pituitary membrane is folded in radii from the centre, or plaited on the two sides of an axis in regular pectinations, like the barbs of a feather, which in some cases, as in sturgeon, are farther subdivided in smaller branches; upon their surface are numerous ramifications of minute vessels, and upon them there is a mucous fluid: the olfactory nerve, issuing from the anterior tubercles of the brain, is single, double, or in several threads. In some it swells into a ganglion on reaching the nasal cavity; in all cases its fibres traverse all the folds of the pituitary membrane with great regularity. It may be conjectured that the number and extent of their folds indicate the degree and power of this organ of smell in the species; but this power is still only comparative. Finally, it is not impossible that the delicate pituitary membrane gives also the faculty of distinguishing the substances impregnating water, not odorous in themselves, but of a nature to be avoided by the fish.

The organs of taste appear to be weak in animals who almost invariably swallow their food without mastication. Even those whose jaws are provided with teeth, fit to cut and bruise their aliment, cannot keep it long in the mouth, on account of the position and play of their respiratory organs; no salivary glands lubricate the parts with a moisture proper to enliven the sense of tasting, and those parts are in themselves sufficiently insignificant. There are species which have not even a prominence in the mouth that can be called a tongue: no fish have one provided with muscles proper for extending or inflecting it as in mammalia. Where the tongue is the most fleshy in appearance, it is composed of cellulous and membranous matter, fixed on the anterior part of the lingual bones: the surface is commonly furnished with teeth, sometimes so closely disposed as to form a kind of pavement, inclosing all remains of what might exist of sensibility in the organ beneath, which receives but a scanty supply of nerves from the glosso-pharyngeal; some portion of the palate or of the pharynx may however supply for the deficiency of the tongue, and possess gustation. Thus we find in carps, at the entrance of the throat, the roof of the palate lined with a fleshy substance, thick and soft, abounding with nerves derived from the eighth pair, and which being opposite to the pharyngeal teeth, seems to furnish the requisite dispositions for supplying the gratifications of the taste of food; but it is nevertheless difficult to establish this conjecture upon solid foundations: this organ has however a peculiar kind of irritability; if it be but touched or pricked that part of the surface will rise, and for a few moments assume the form of a conical button; the same effect may be produced successively on every part of the organ while vitality remains, which we know continues in carps for some time after the head has been taken off the body.

The organs of touch in fishes are as imperfect as those of tasting. Without prolonged members, and in particular without flexible fingers capable of grasping, they can scarcely explore the forms of objects by any other means than by their lips. The appendices or barbels which siluri, loches, several gadi, and cyprini, have round the mouth; the filaments or rays, springing from the pectoral fins of gurnards and polynemi; the moveable rays on the heads of anglers, serve more to give notice of the approach of strange bodies, than to ascertain their form and other tangible qualities, and nevertheless within the limits prescribed to them, their organs are very sensitive, and possess nerves remarkably large. The external covering of fish, particularly when composed of scales, cannot possess much sensibility. But there is in this particular an infinite variety of modifications: from the perfectly naked skin of lampreys, or that of eels, furnished with small thin scales, sunk in a thick epidermis, to the bony shields which occur on the sturgeon, and the inflexible cuirass of trunk-fish (ostracion), formed by their being soldered together. The scales of fish consist of a corneous, and often of a calcareous substance, chemically resembling the composition of bones and teeth. They are usually imbricated; that is, overlapping each other like tiles. Some are very thick, entirely stony, very close, but scarcely overlaying, and forming a real tigulated armour, as we find it in lepisosteus, bichir, &c. In the species of eels, the scales are not contiguous, but strewed very closely, and incrusted in the epidermis. Turbots and cyclopteri, are provided with some in the form of cones or tubercles, adhering by their base with naked spaces round them; similarly formed scales, but reduced in size to small points, cover the body of most tetrodons. In diodon these points become long spines, with an enlarged basis to support them. The sharp granulations on the skins of dog-fish, and of most chondropterygians, are also a kind of scales in the form of a rasp, which, when sufficiently close, can be polished down, and become what is termed *shagreen.* But the most complete scales, which show their affinity to teeth, are the thorns on the back of rays; their oval and raised basis is hollow, and receives vessels to feed a pulpy nucleus, greatly resembling that of a tooth.

From the dermis is secreted beneath the scales, that brilliant silvery substance which confers a metallic lustre upon so many fish: it is composed of small laminæ, resembling burnished silver, capable of being removed by washing from the skin or from the under surface of the scales, and with this substance the well known false pearls are coated. In many species of fishes it is likewise secreted in the thickness of the peritoneum, and about the swim bladder. Scales extend more or less upon the fins, and in the squamipinnæ, the dorsal and anal fins, are covered with them almost as completely as the rest of the body. Those on the lateral line are distinguished from others by one or several little tubes passing through them, and often by other particularities. There are also instances of the scales forming the lower edge of the belly, being compressed, sharp, and in their arrangement presenting a kind of external sternum, resembling a saw, as may be seen in herrings and serra-salmons. The kind of teguments furnished by scales is very proper for protecting the animal against the shocks and frictions to which it is exposed, and for facilitating natation; but offers little protection against changes of temperature. Fishes are, however, less sensible of cold than birds or quadrupeds, because the temperature of the surrounding medium is about equal to their own.

The organs of nutrition of fishes are analogous to those of other vertebrated animals: they take and divide their food with the teeth; it is subjected to a first digestion in the stomach; thence passing into the intestinal canal, it is impregnated with the bile discharged from the liver, and usually also with a liquid like that of the pancreas; the nutritive juices, absorbed by vessels analogous to lacteals, and perhaps also in part by a direct action of the veins, are mixed with the venous blood, carried to the heart, and thence to the branchiæ, where the contact of the ambient element converts the mixed fluid into arterial blood, which then proceeds to nourish the whole system: some parts of it are, however, carried off in transpiration, in the form of liquids oozing through the skin, and finally by the reins and urinary apparatus. We must therefore say a few words relative to the organs of manducation, digestion, circulation, respiration, and of the excretions.

Manducation and teeth. We have already shown how fish seize their prey and swallow it; this being chiefly performed by means of the teeth, it is proper to notice them more particularly. Fish may have teeth adhering to all the bones which form the inner surface of the mouth and of the pharynx; they may be found on the intermaxillaries, the maxillaries, the palatine, the vomer, the tongue, the branchial arches, and the pharyngeals; there are even genera possessed of teeth upon all these bones, either entirely similar, or partly of different characters; but several of these bones may be without teeth, and there are also genera entirely deprived of them. To indicate their position, they are denominated intermaxillary, maxillary, mandibulary, vomerian, palatal, pterygoidian, lingual, branchial, and superior and inferior pharyngeal. In form they vary no less than in position, requiring still more numerous distinctive appellations; they represent most commonly cones and hooks, more or less sharp. When these hooks are numerous, and formed in several rows, or in quincunx, they are said to be *carded*, or in cards; they are often also subulate, and so close, as to offer to the eye an idea of *plush* or *velvet*, and if they be at the same time very short, they represent *smooth velvet;* but if long and flexible, they may be termed *brushes;* finally, very small and short teeth, more readily detected by the touch than by the eye, form simple *asperities.* Beside these kinds, there are sharp teeth in the form of wedges, which may be serrated, or fined to a point in the middle. Other teeth are round, hemispherical, or oval. The round kinds may be disposed in several rows, or closed so compactly as to resemble a pavement, such as on the palate and tongue of glossodontes, and jaws of thornback; others again are pointed, compressed, and sharp-edged on both sides, as in trichiurus; others with the crown flattened, and embossed with raised lines, as in the pharynx of carps; or swelling into a clavate form, observable in other cyprini; and finally, teeth with a tubercular crown, as observed in myletes.

The teeth are always simple, reared upon a pulpy germ equally simple; their growth is by layers, as in mammiferæ; but it never extends to the formation of roots fixed into alveoli. As in monitors, and some other saurians, they consist merely of the crown, and when this part is complete, the pulpy nucleus upon which they are formed becomes ossified. When the tooth must be shed, it breaks off; the ossified foot becomes united with, and is converted into part of the jaw. There is, however, some exception to this rule; as, for example, in the anarrhicas, whose bony nuclei being prominent, and larger than the teeth themselves, are shed with them in a manner probably analogous to the shedding of deer's antlers. Teeth are reproduced during a great part of the life of fishes, and to all appearance without fixed periods; the new tooth rising before, beside, or behind, the one it is destined to replace. Vertical reproduction is most common for round teeth, which rise from a cavity seated deeper than the nucleus of the preceding, and pierce the bone after the former is obliterated. Those which are replaced laterally are mostly the great conical hooked, or cutting teeth; they pierce the bone by the side of the tooth still in its place.

Among the more curious dentitions are those of the inferior pharyngeals of carps, forming half collars in the pharynx; and the triangular enamelled plate in the basilary bone. Those of scari, forming a kind of parrot's bill. Those of tetrodons and diodons, whose entire jaw is armed with only two, or even one compound tooth. Those of chimæræ and mylobates, also compound teeth, rising from a multitude of germs in the form of filaments, and forming plates covered with a common enamel. Those of lampreys, consisting of thin cornets, formed upon fleshy moulds. Finally, in squali, the nucleus of the teeth remains for a long time cartilaginous and flexible, so that the reserve teeth are laid back against the palate; but the moment a necessity comes for their employment they are erected, and their base grows speedily hard and resisting.

Deglutition. Most osseous fishes having no muscles in the lips, or if they be fleshy, none proper to retain the aliment in their mouths, have on the inside of each jaw, behind the anterior teeth, a kind of membranous valve, formed by means of a fold of the internal skin, and turned towards the gullet, preventing in particular the water taken into the mouth for respiration from escaping back again. Aliment also, held by the teeth of the jaws, retained by the valve, carried further back by the teeth of the palate and tongue, when they are found in the species, is prevented passing between and injuring the respiratory apparatus, by the denticulations upon the branchiæ. The action of the jaw and of the tongue operates only in the direction of the pharynx, where the food is further acted upon by the pharyngeal teeth, which both triturate and force it onwards into the œsophagus. This viscus is covered with a layer of strong muscular fibres, closely joined, and forming sometimes divers fasciculi, whose contractions force the alimentary *bolus* towards the stomach, and thus complete deglutition, for fishes being destitute of neck, the œsophagus is necessarily very short.

Intestinal canal. The digestive organs are inclosed in the abdominal cavity, which is separated forwards from that containing the heart, by means of a kind of diaphragm of small dimensions, composed of extensions of the pericardium and peritoneum, and containing within its texture the great venous sinus. Another cavity extends along the spine, containing the kidneys and the swim-bladder. It is divided from the abdomen, properly so called, by the peritoneum, which as in other animals forms also a fold to suspend the viscera it contains, namely, the intestinal canal, the liver, spleen, and pancreas, when there is one. The organs of generation and urinary bladder are likewise contained in a fold of the peritoneum.

There are two remarkable openings on each side of the anus in many fishes, such as rays, squali, sturgeons, lampreys, salmon, &c.; through which the interior membrane of the peritoneum becomes continuous with the epidermis, and assumes a mucous character: two other openings, at least in rays and squali, extend this continuity to the pericardium and entire lining membrane. The intestinal canal is composed of the same tunics, and the variations they suffer, and folds they form, are analogous to those of other vertebrated animals. The internal folds of the œsophagus are in general longitudinal; its cavity is prolonged to the bottom of the cul-de-sac of the stomach. Sometimes, as in labri, this cul-de-sac is wanting; and instead, there is only a slight dilatation of the canal; but more commonly the stomach forms a bend, or gives off from a part somewhere near the entrance on the right side the branch which terminates at the pylorus. This branch running transversely, or even upwards, sometimes, as in salmon, thymallus, and mugil, becomes in the tunic of such muscular density, as to assume the character of a true gizzard.

The conditions of the ventricular sack are infinitely varied; the thickness of the membranes, and folds, &c. would demand separate articles to be fully discussed. The intestinal canal varies in like manner in breadth, length, and folds; is more or less dense, villous, &c.; but there is never a cœcum, as in quadrupeds. One of the most remarkable folds in the intestines of fishes is the spiral valve of rays, squali, and sturgeons. Near the pylorus, many species have cœcal appendices, sometimes in considerable number, within the doublings of which a viscous liquor appears to be generated, supplying, it is supposed, the office of the pancreas; and as fishes are in general deprived of salivary glands, they likewise perform their office. Scombri and gadi are abundantly supplied with them, while in labri, siluri, cyprini, and lucii, they are entirely wanting. The vent is placed in very different parts, and does not depend on the position of the ventrals, excepting that in no case is it found before them; nor is it ever further back than the commencement of the tail, although the abdominal cavity is often prolonged in the form of a sinus considerably farther back than the opening of the anus.

The spleen is likewise found in different locations; it varies in size, but is never found wanting, nor more than one. In general, it lies about the middle of the folds of the intestinal canal, receiving arterial blood only, and after elaboration transmitting it to the liver, which also receives the blood of nearly all the intestines. The liver is usually large, and placed somewhat to the left; in figure, and in the number of lobes, it varies exceedingly, but there is always a gall-bladder; the excretory ducts sometimes, as in tetrodon mola, Lin., opening into the stomach. The hepatic ducts are sometimes numerous. The mesentery is very incomplete, often reduced to a few fræna, in which the vessels and nerves are wrapped up; this tunic is often prolonged into appendages filled with oily grease, and constituting real epiploons. No conglomerated glands appear in the mesentery, and nevertheless it is furnished with lacteal vessels, as in other animals; absorbent vessels are in fact as numerous; and it may be inferred, that nature follows in fishes the same system of absorption as in other vertebrated animals.

Circulation. Fish, like warm-blooded animals, are provided with a complete circulation for the body, another equally complete for the organs of respiration, and with a particular abdominal circulation, terminating at the liver by means of the vena portæ; but the particular character of this part of their organization consists in the branchial circulation alone being provided at its basis with a muscular apparatus, a heart corresponding to the auricle and right ventricle of the other class of animals just mentioned, and that they have nothing similar at the basis of the circulation of the body; in other words, that here they are entirely deprived of an organ to represent the left auricle and ventricle, their branchial veins changing into arteries without a muscular inclosure.

The muscular apparatus of their circulation is composed of the auricle, the ventricle, and of the bulb of the pulmonary artery, the auricle being preceded also by a large sinus where all the veins of the body terminate; thus four cavities separated by contractions are successively traversed by the blood in passing from the body to the branchiæ. Their size is inconsiderable when compared with the bulk of the body, and does not increase in the same ratio with the growth of the animal. Three of these receptacles, the auricle, the heart, and the bulb, are lodged within the pericardium, which is itself situated below the pharyngeal bones, between the inferior parts of the branchial arches, and externally protected by the humeral bones. The great venous sinus is not placed within the pericardium, but between the external membrane of that cavity, and the membrane which represents the diaphragm. This sinus lying transversely, receives by different trunks the veins of the liver, of the organs of generation, the kidneys, the fins, the branchiæ and throat, and finally, those of the head; which last partly pass themselves through a sinus at the back of the cranium. The whole of the blood thus collected in the sinus passes, by a single orifice in its anterior convexity, into the posterior part of the auricle, where there are for this purpose two membranous valvulæ opening towards the auricle. This organ, placed before the great sinus, and within the pericardium, is above the ventricle that is against its dorsal surface, and presents very different configurations in different species. The orifice opening from its inferior side into the superior face of the ventricle, is likewise furnished with two valvules, representing the mitrals in man, but more simply attached. In osseous fishes, the ventricle is most usually of a tetrahedral form; in the cartilaginous it is rounded and often depressed. It lies beneath the auricle, the cavity turned so as to be almost vertical next the auricle, and horizontal towards the bulb. The coats are very robust, furnished interiorly with powerful fleshy supporters, their substance formed of two very different layers; the internal having fibres more transverse, and the external others more longitudinal; both so little united, that they sometimes cease to be continuous, and appear to form a second ventricle, but this may be a result of incipient decomposition.

In the bulb of the branchial artery are found the strongest fibres, mostly disposed in a circular manner. It communicates with the ventricle by means of two or three membranous valvules; but in cartilaginous fishes there are often more valves, and sometimes they are of a fleshy nature. The prolongation of the bulb passes out of the pericardium, becomes the branchial artery, and penetrates forward beneath the chain of single bonelets that connects the branchial arches. It is soon divided, throwing off a branch to each branchia; these branches pass along a groove situated on the inside of each arch, more externally than the vein running along the same curve, but in an opposite direction. To the arch a great number of leaflets are attached, in parallel ranges, ordinarily terminated in forked points, often deeply indented. The great branch passing along the arch, gives off a smaller to each of the leaflets, where it bifurcates twice, and spreads into a multitude of minute vessels, meandering upon the surface of each leaflet, until they are finally converted into very small veins. These all terminate in one of the branchial veins which pass along the internal border of the leaflet, and both open into the greater vein of the arch, so that these carry back the blood which the arteries have brought forward. But in passing out of the dorsal part of the branchiæ, the branchial veins assume the structure and functions of arteries; even before their arrival at this point, the anterior send several branches to different parts of the head, and it is proper to remark, that the heart and several parts lying in the breast receive blood from a branchial vein, by means of an offset issuing nearly from its source, and therefore much anterior to its exit from the branchiæ; nevertheless, it is only when the trunks of the four branchiæ are united, that the great artery is formed, which supplies the viscera and parts of the body, and is therefore the artery which represents the aorta of mammiferæ, although it is destitute at its basis of both ventricle and auricle. For the left cavities of the heart of mammalia, we here find substituted a simple vascular apparatus, situated above the branchiæ, while the right cavities, which are properly represented, lie beneath them.

The aorta already noticed gives off at the beginning a large branch for the viscera, variously distributed in different species, to the liver, the stomach, intestines, spleen, genitals, and swim-bladder; and after feeding, by means of other branches, the kidneys, the intervals between the ribs, and the muscles of the trunk in general, it passes on into the annuli, beneath the caudal vertebræ, and follows the direction of the spine. The blood distributed into the head, the trunk, the branchial apparatus, the genitals, and swim-bladder, returns towards the heart by the great venous sinus; but with the exception of some ramifications, that of the stomach, intestines, and spleen, passes to the liver by the vena portæ, which is a communication liable to be greatly diversified in different species of fishes.

Respiration. The blood of fishes is exposed to the influence of the ambient liquid by means of an almost infinite subdivision of vessels on the surface of the branchial leaves; that liquid is water passing incessantly through the branchiæ by means of the jaws, and the opercular and hyoidean apparatus acting in concert, as in other animals it is performed with air; but the action of water upon the blood is much less powerful than that of air. It is not by means of the liquid, nor yet of the oxygen contained in it, but by the small quantity of air mixed with and held in solution in the water, that their respiration is carried on; for if the air be expelled by ebullition, they cannot live in it, and many species are obliged to rise to the surface for the purpose of breathing in the atmosphere, particularly when the quantity in the water is exhausted. This is proved in several cases by merely keeping fish below the surface under a net of gauze, which is sufficient to suffocate them.

As with other animals, in respiration, both atmospheric air and that contained in water give off their oxygen. But the absorption of oxygen is trifling, for it has been calculated that a man consumes of it fifty thousand times more than will be required by a tench. Fish perish when exposed out of water, not so much for want of oxygen, as because their branchiæ become dry, and the blood cannot circulate in them with sufficient freedom. Hence the species whose branchial openings are small, as the eel, or those who possess a receptacle for water, like anabas and ophicephalus, remain alive longer in the air, than those whose gills are very open, like the herring, who expire at the instant they are drawn out of the water. It is remarked, that many fresh water species which are subject to be at times deprived of water, have organs of respiration of peculiar structure, and often admitting of air more highly oxygenated than is the case with others, and thus have a greater tenacity of life. There are labyrinthiform cavities in the head, and they often have besides peculiar swim-bladders.

Secretions. The secretions of fish are performed through the skin, or through special secretory organs. The kidneys, ureters, and bladder, with its external opening behind the vent, the reverse of what obtains in quadrupeds, perform the urinary functions. Different humours elaborated in particular vessels, opening externally, moisten the skin in different places. In general it is a mucus not easily diluted in water. In rays, there is for this purpose a great vessel surrounding the nose, with several branches, and a white receptacle or bag at each angle of the branchiæ, from whence other vessels radiate to distant points of the skin. Sharks have the snout filled with a kind of mucilage, and vessels leading from thence along each side of the body. Gadi, eels, &c. are equally provided with similar vessels. The lateral line usually is possessed of a secretory structure, operating through the tubes which perforate the scales of that part. One of the most remarkable secretions is the air found in the swim-bladder, which in numerous genera has no external communication. The organ is composed of a very fine internal tunic, and of an external coarse and fibrous one. It is inclosed within the general coating which the peritoneum spreads over all the viscera. It is variously formed, simple, forked, divided into two, or even three compartments; supplied with several appendices, and opening into the intestinal canal, the œsophagus, or the stomach. It contains in general azote, mixed with particles of oxygen or carbonic acid, and in fishes habituated to live at great depths, the oxygen has been found so high as forty, and even, in one case related by M. Biot, as eighty-seven per cent.

The most obvious use of the swim-bladder is to keep the animal in equilibrium with the water, or to increase or reduce its relative weight, and thereby cause it to ascend or sink in proportion as that organ is dilated or compressed. For this purpose the fish contracts the ribs, or allows them to expand. Certain we are, that when the air-bladder is burst, the animal remains at the bottom, turns up the belly, and becomes deficient in the powers of motion. A curious phenomenon is observed in fishes caught with hook and line at great depths, and drawn up suddenly: for the air contained in their swim bladders expands, as they are ascending, more rapidly than they can counteract by compression, and either it bursts, and the abdomen becomes inflated, or by expanding forces the œsophagus and stomach out at the mouth. With regard to the presumed assistance which the swim bladder affords in respiration, it is a fact that when a fish is deprived of that organ, the production of carbonic acid by means of the branchiæ, is very trifling: but there is no sufficient foundation for assuming that it offers any analogy to lungs. There are however grounds for admitting, that in many species, in whom the anterior part of the swim bladder approaches the auditory apparatus, an additional power of hearing is thereby conferred, and small bones considered as analogous with the malleus incus and stapes, appear to be in contact with it in several Gangetic fishes.

But whatever the use and importance of this organ may be, there remains the difficulty of explaining why it should have been denied to a great number of species, not only of those whose habits require a constant residence on the floor of the waters, such as rays and pleuronectes, but also to others who do not appear to yield to any in velocity and activity of life. Such, for instance, as mackerel, for in this case the presence or absence of the swim bladder is not even in conformity with the other organs of the fish, there being a species (scomber pneumatophorus) very similar in other respects to the common mackerel, and yet provided with an air bladder, although no such organ occurs in its congener. Polynemus paradiseus is without, but all the others of the genus have one; in the sebastes it is very large, but in the next genus scarcely the size of a pea. Some conjectural inferences on the modification of the manners and character of the species resulting from the possession or the privation of this organ, may however be offered, such as we have already produced, and may again refer to in the particular reviews of the greater sections or families of this class.

The electrical shocks which it is in the power of some species of fish to give other bodies, present another striking singularity in their structure, particularly as the organs used for that purpose are no less different among them than they differ from all other species of organs. In torpedos the apparatus consists of membranous tubes, filled with mucosity, and divided by transverse partitions closely pressed together, like honey-combs; it is placed on each side of the head, and provided with enormous branches of nerves from the fifth and eighth pair. In gymnoti the whole of the under part of the body is densely furnished with parallel laminæ, separated by thin layers of mucilage. In silurus two layers of different substances are interposed between the skin and the muscles, over the greater part of the body, the exterior of which is cellulous and aponeurotic on the internal surface, receiving nerves from the fifth pair; and the interior layer is of a flocculent texture, deriving nerves from the intercostals. By means of these organs, where, on account of the alternation of different laminæ, analogy has been considered to exist with a galvanic pile, the animals can give or withhold at will, shocks truly electrical to those who touch or only approach them; they are to them a powerful instrument of defence, and serve probably also to stun their prey.

Organs of generation.—The rays, sharks, and chimæras, who produce large roes or eggs, protected by strong horny shells, as well as those who bring forth living young, are provided with organs of generation resembling the same parts in reptiles. But other fishes, even such as are viviparous, which require fecundation before they can lay, possess these organs in extremely simple forms; that is, in the female, they consist of two membranous bags, the sides of which having various folds, contain the roes within their density until they have acquired the necessary development, and escape by bursting the membranous coat which held them; and in the male, who is likewise furnished with two bags, they contain a great quantity of fecundating liquid, secreted through the glandulous tissue of their sides: these two kinds are what is termed the roe and the milt of fishes. The ovaria of fishes in general, vary in size and in the number of lobes into which they are divided: sometimes one of the two is obliterated or not developed, as is the case in perch; more commonly they are two, of an oblong form, with the internal side forming several folds, according to the quantity of roes they have to contain.

Blennies, silures, anableps, and other viviparous species, do not differ from the others in the structure of their ovaries. They form two bags, composed each of two tunics, between which the roes are seated; in growing, these protrude and hold to the bag merely by a pedicle. In this state their bulk augments, and the germ is developed, as for ordinary fishes it would develope in the water; both the bags or ovaries are usually connected by a common canal, opening behind the vent, and in front of the urinary orifice. The arrangement of the testiculi or milt is the same; frequently this issue is not simple, but shaped with a small tongue in both sexes, and it is possible they serve in coition, for this formation is more particularly observed in the genera which have many viviparous species, such as blennies, gudgeons, &c. In eels, lampreys, and others, the ovaries are exteriorly divided into a number of lobes variously shaped, holding the roes, not in bags, but in a collection of leaflets. No canal is visible, and the spawn can escape only by dropping into the abdomen, and thence passing out through one of the two openings at the side of the vent. This at least is believed of the lamprey, and conjectured to be the case with eels. Even trout is asserted to be in the same condition, for the ovaries are closed on the side of the abdominal cavity, and what might be taken for the oviduct is reduced to a simple ligament. The number of roe eggs contained in prolific species is sometimes prodigious, amounting in several to hundreds of thousands.

There are found occasionally individual fishes, who have on one side an ovary, and on the other a milt, or testiculus, and who therefore are true hermaphrodites. It seems even that certain species naturally unite the organs of both sexes. Cavolini asserts this to be the case in a serranus, and Sir Everard Home in both eels and lampreys.

Rays and squali have these organs more complicated. The testicles of rays, placed upon the stomach, towards the summit of the abdomen, are composed of lobes harder and rounder, and of a part that is soft, and more like the milt of ordinary fishes : in squali they form large cylinders, coiled in a vermiform manner, and internally divided into an infinity of small vessels. From their summits arise two epididymi, each composed with many folds of a single *vas deferens*, becoming smaller and less tortuous as it approaches the vent : after swelling into a kind of seminal vesicle, it opens along with that of the other side into a conical prominence of the superior side of the rectum, near the vent. The females are provided with two ovaries, where the yolks of the spawn grow as in poultry; those that escape are received by the funnels of the two oviducts opening above the liver near the diaphragm. These oviducts are membranous at first, and traverse a gland of a particular tissue, shaped like a kidney, which it seems secretes the horny substance of the shell; after passing through this, the roe descends the continuation of the channel, and passes into a bag, situate above the rectum, and constituting a real uterus: this opens by a large orifice at the extremity of the rectum. There is some modification in the structure of the organs of sturgeons; the egg spawn of rays is fibrous, resembling horn, in form square, flattened, with angles prolonged in points. In sharks the surface is often yellow and transparent, the form oblong, and the angles terminate in long coils of horny cords, which the Baron considers as secreted in the lateral furrows of the oviduct, which traverses the gland. The spawn of chimæras is likewise wrapped in a strong flat shell, of horny substance, oval and hairy; while that of callorinchus Australis bears a singular resemblance to a broad leaf of sea-weed, within the coats of which the fish, already perfect in form, is discovered suspended in fluid[1].

In viviparous squali, whose embryos are developed in the oviducts or in the uterus, such as true sharks, there is around the fœtus only a membranous wrapper, which nevertheless still shows the tortuous cords found about the shell of others.

Some species of fish carry their egg-spawn upon them after extrusion, and there are others continue the same until the fry is brought forth. Thus syngnathus possesses behind the vent, in the basis of the tail, a groove, closed by two scaly pieces like shutters, wherein the roes remain placed in order until they are hatched; and it was this particularity which caused Aristotle to assert that this kind of fish split for spawning. Aspredi carry their roes attached to the skin of the belly; but the greater number of fishes produce the roes in the water, agglutinated by a kind of mucilage which envelopes and attaches them to stones and aquatic plants; sometimes, in the form of bunches, at others like cords, or like net work; the roes are then transparent globules, within which the yolk is visible. In this state they are fecundated by the fluid or milt of the males who pass over them, and at that period show the greatest activity: it is at this period also that many ascend rivers, some live in pairs, others become gregarious and migratory. The germ appears earlier or later in the fecundated roe, according to the temperature, and is growth is in general slow: the young fry, before it is much increased in bulk, usually opens a passage by means of its tail, through the covering membrane. In osseous viviparous species, such as siluri, anableps, and certain blennies, the roe swells in the ovarium, sufficiently for the growth of the fœtus within, and there are species where this growth is considerable.

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[1] I have received the information relating to callorinchus from Captain King, R.N. C. H. S.

All the egg roes contain beside the fœtus also a vitellus, which communicates by a pedicle with the intestine of the fœtus, and an external membrane similar to that of the eggs of birds. No amnios has yet been observed, for the internal tunic of the membrane, involving both fœtus and vitellus, can scarcely be admitted to be such. What constitutes the principal distinction between the roe of fish, the spawn of batrachi, and the eggs of other animals, who, when hatched, are necessitated to breathe by lungs, is, that they are totally devoid of the allantoid and of umbilical vessels, which are at no time discernible; hence, there is no placenta, and yet the vitellus of the fœtus of sharks appeared to the Baron much contracted, and adhering to the uterus nearly as firmly as a placenta, the cord being much ramified with vascular appendices like a kind of coarse hair.

When the fish is once brought into external life he is henceforth left to his own powers of subsisting. The far greater number perish, devoured by larger fish, aquatic birds, and reptiles; the survivors increase in size with greater or less rapidity, according to the species. In some this growth continues nearly the whole of their lives, and there are others whose life is of considerable duration. Carps, for example, are said to attain the age of more than a century.

After this rapid sketch of the organization of the class in general, we proceed to the Baron's distribution of the first order.

THE

FIRST ORDER

OF

FISH.

ACANTHOPTERYGII,

Form the first and much the most numerous division of common fish. They are known by the spines which represent the first rays of the dorsal fin, or which alone sustain their anterior fin of the back when they have two. Sometimes instead of an anterior dorsal fin they have nothing but a few free spines. Their anal fin has also some spines instead of the first rays, and there is in general one to each ventral fin.

These fish have such numerous relations one with another, their several natural families offer so many varieties in the apparent characters which one might think capable of indicating orders or other subdivisions, that it is impossible to divide them otherwise than by these natural families themselves, which we are obliged to leave entire.

The first family of the acanthopterygii, or

The PERCOÏDES[1]. *The* PERCH.

So named because the common perch is the type of them, comprehends fish with an elongated body, covered with hard or rough scales, in which the operculum or preoperculum, and frequently both, have indented or spinous edges, and in which the jaws, the front of the vomer, and almost always the palatines, are furnished with teeth.

Their species are much multiplied, especially in the seas of hot countries; their flesh is generally wholesome and palatable.

By very far the greater number of these percoïdes have the ventral fins attached under the pectoral; they form the first division, which may be called the

THORACIC PERCOÏDES.

They were nearly all included by Linnæus in his genus PERCA; but we have been obliged to subdivide them as follows, from the number of rays of the gills, the number of dorsal fins, and the nature of the teeth.

The first division has seven rays to the gills, two fins on the back, and all the teeth short and even.

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[1] In my first edition this family included also the fish with armed cheeks, the sciænoides and the sparoides. I have separated these three new families, and I think I have been fortunate enough to find sufficient characters for that purpose.

The Perch (properly so called) Perca, *Cuv.*

Have the preoperculum indented; the osseous operculum terminated by two or three sharp points; the tongue smooth. Sometimes the suborbital and the humeral bones are indented, though slightly.

The common Perch, Perca fluvialis, L. Bl. 52.

Greenish, with large vertical blackish bands; the ventral and anal fin red. This is one of the prettiest and best of our fresh water fish. They live in pure waters. Their eggs are united by a viscosity into long interlaced cordons. North America produces some species allied to this[1].

Labrax, *Cuv.* *The* Basse.

Are distinguished from the perch by scaly opercula, terminated with two spines, and by a tongue covered with prickles.

The common Basse, Labrax lupus, Cuv. *Perca labrax,* Lin. *Sc. diacantha,* Bl. 305. Cuv. and Val. ii. xi.

Is a large fish of our coasts, of an excellent flavour and silvery colour. It is especially very common in the

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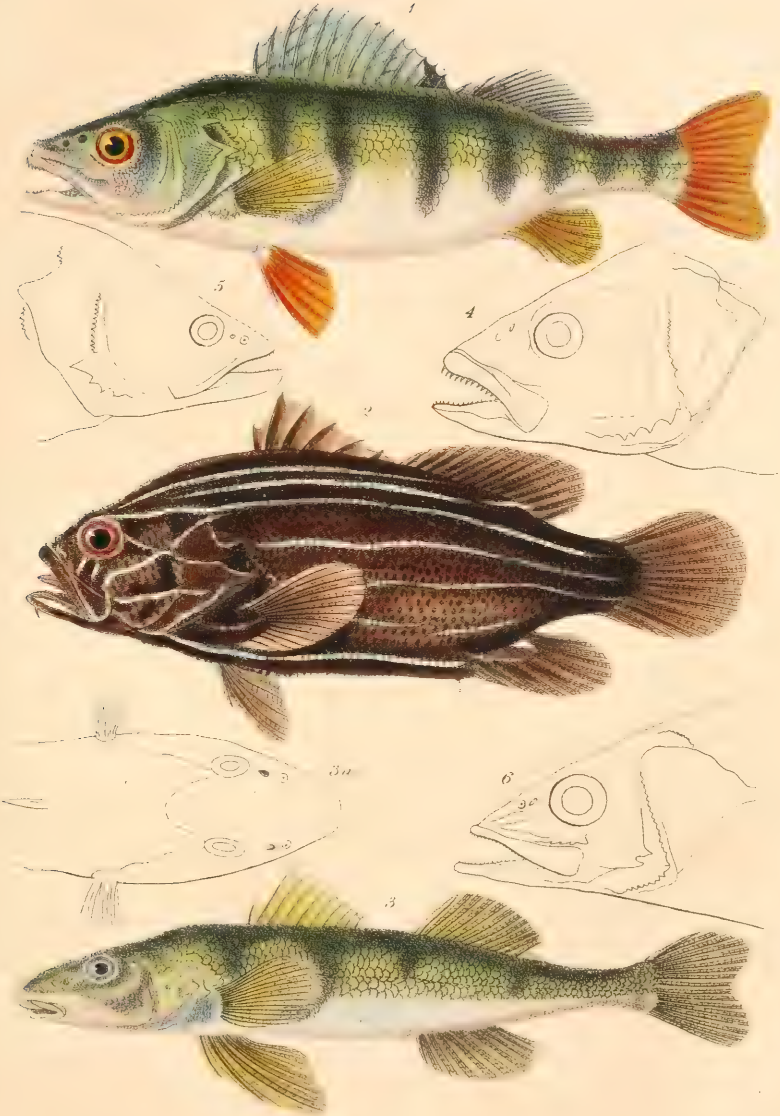
[1] *Perc. flavescens,* Cuv. and Val. ii. p. 46. *P. serrato granulata.* ib. 47. *P. granulata,* ib. 48. and pl. ix. *P. acuta,* ib. 49. and pl. x. *P. gracilis,* ib. 50. Add *P. plumieri* or *sciæna plumieri,* Bl. 306. or *centropome plumier,* and *cheilodiptère chrysoptère,* Lacep. iii. xxxiii. *P. ciliata,* Kuhl. *P. marginata,* Cuv. and Val. 53.



1 Perca serrato granulata 4 Head of Labrax vulgaris.
2 Grammistes orientalis 5 „ Lates nobilis
3 Aspro vulgaris 6 „ Centropomus undecimalis

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Mediterranean, and was the *lupus* of the Romans, the *labrax* of the Greeks. The young are generally spotted with brown.

There is in the United States a fine and large species, striped longitudinally with blackish. (*Labr. lineatus*, Cuv. *Sciœna lineata*, Bl. 304. and *Perca saxatilis*, Bl. Schn. pl. xx [1].)

We might moreover separate from labrax a species from the United States, which has scales even on the maxillary bone. (*Labrax mucronatus*, Cuv. et Val. ii. 12.)

LATES, *Cuv.*

Scarcely differ from perca, except by strong indentations, and even one small spine at the angle of the preoperculum, and by stronger indentations also on the suborbital and humeral bones.

Lates niloticus, Cuv. *Perca nilotica*, Lin. *Keschr.* of the Arabians, Geoff. Eg. Fish pl. ix. f. 1.

Is a very large and a very good fish, already noticed by the ancients, (their *latus* or *lates*) of silvery colour.

The rivers of India support other species [2].

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[1] This is also the *Perca Mitchilli*. Trans. of New York. t. i. 413. Add *P. elongata*, Geoff. Eg. pl. xix. 1. *Lab. waigiensis*, Less. and Garn. Cuv. and Val. ii. 83. *Lab. japonicus*, Cuv. ii. 85.

[2] The *pêche naire* of Pondichery or *cock-up* of the English of Calcutta. *Lates nobilis*, Cuv. Russell ii. 131. Cuv. and Val. ii. 13. which is also *holocentre heptadactyle*, Lacep. *Holoc. calcarifer*, Bl. 244.

CENTROPOMUS, *Lacép.*

Have the preoperculum indented, but their operculum is obtuse and armless. Only one is known [1].

Cen. undecimalis, Cuv. *Sciæna undecimalis*, Bl. 305. Cuv. and Val. ii. 14.

A large and good fish, known throughout the hot parts of America, under the name of *pike*, and which has indeed the muzzle depressed like our true pike; but its teeth are even, and all its other characters are those of the percoides with two dorsal fins. It is silvery tinted, with greenish, and has a lateral blackish line [2].

GRAMMISTES, *Cuv.*

Have spines to both the preoperculum and the operculum, but without the indentations; their two dorsal fins are near each other. The scales are small, and immersed, as it were, beneath the epidermis; the anal fin is without a visible spine.

The species are small, striped longitudinally, white on a blackish ground. They come from the Indian Sea [3].

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[1] Lacépède has included in his genus centropome, many fish which have not its characters, as the *labrax*, the *lates*, &c.

[2] Bl. pl. cccv. has improperly tinted it red, the *spyrène orvert*, Lacep. v. pl. iv. f. 2. is only a bad figure of this fish. It is also the *camuri* of Margrave.

[3] *Grammistes orientalis*, Bl. Cuv. and Val. ii. pl. xxvii. The *sciène*

ASPRO, *Cuv.*

Have the body elongated, the two dorsal fins separated, broad ventral fins, the teeth velvety, the head depressed, the muzzle more advanced than the mouth, and terminated in a round point.

There are two species in the fresh waters of Europe; their flesh is light and pleasant.

Aspro vulgaris, Cuv. *Perca asper*, Lin. Bl. 107. 1 and 2 Cuv. and Val. ii. 26.

Of the Rhone, and its tributary streams; greenish, three or four vertical blackish bands, eight spines to the first dorsal fin.

Perca Zingel, L. Bl. 105.

Of the Danube, larger than the last, but like it in colour; thirteen spines to the first dorsal fin.

This subdivision includes moreover certain foreign fish, singular enough in their conformation to give occasion for as many subgenera.

HURO, *Cuv. and Val.*

Have all the characters of the perch, properly so called, except that their preoperculum is not indented[1].

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rayée, Lacep. iv. 323; his *Perseque triacanthe*, ib. 424; his *Perseque pentacanthe*, ib.; his *Bodian six raies*, ib. 302; his *Centropome six raies*, v. 690; and the *Perca bilineata*, Thunb. Nov. Act. Stock. xiii. pl. v. p. 142 appear to be varieties of this fish.

[1] *Huro nigricans*, Cuv. and Val. Vol. ii. pl. xvii.

ETELIS, *Iid.*

Join to the characters of these same percoides bent teeth in their jaws, but not as in the sandres, in their palatine[1].

NIPHONS, *Iid.*

Have the teeth even like the perch, and strong spines at the bottom of the operculum and preoperculum[2].

ENOPLOSUS, *Lacép.*

Have the characters of the perch; stronger indentation at the angle of the preoperculum, and especially the body very much compressed, and as well as the two dorsal fins very high vertically[3].

DIPLOPRION, *Kuhl. and Van Hasselt.*

Have, in addition to the characters of the perch, the body compressed, a double indented edge at the bottom of the preoperculum, and two spines at the operculum[4].

APOGON, *Lacép.*

Have the body short, and furnished, as well as the operculum, with large scales, which easily fall off;

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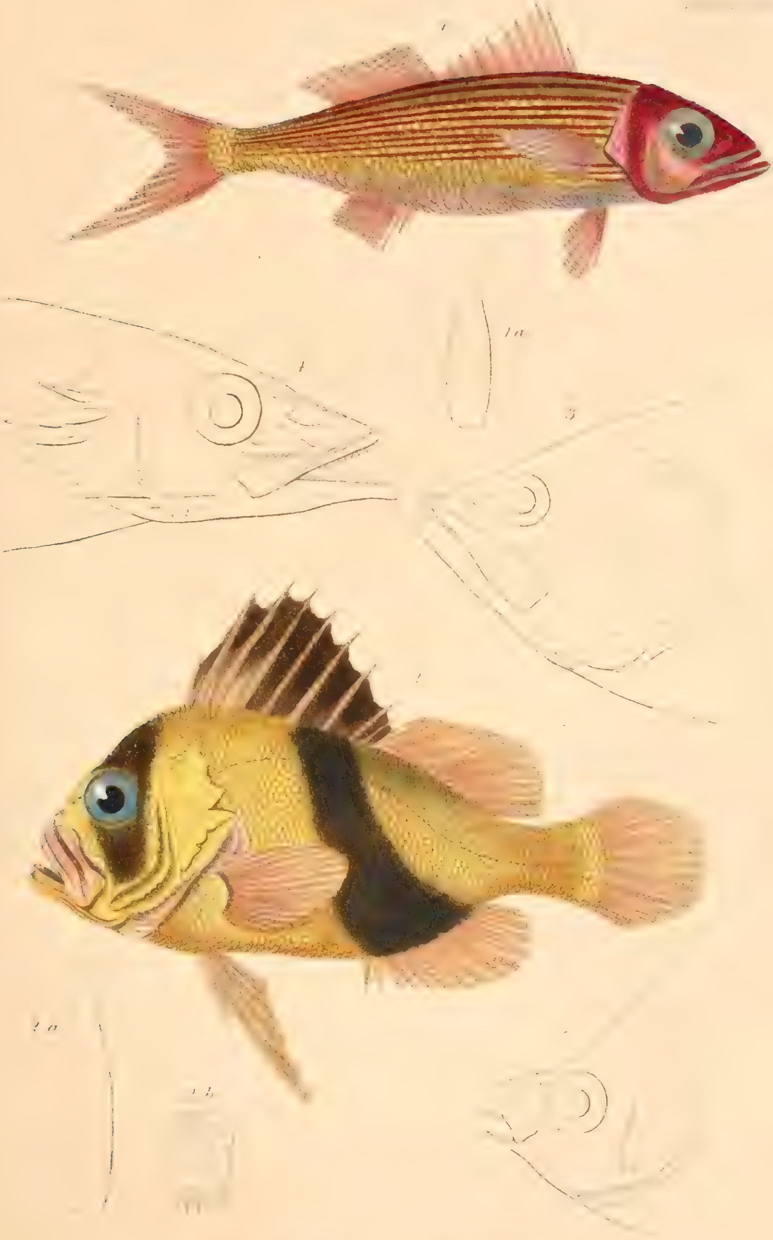
[1] *Etelis carbunculus*, ib. pl. xviii.

[2] *Niphon spinosus*, ib. xix.

[3] *Enoplosus armatus*, ib. xx. or *Chætodon armatus*, J. White.

[4] *Diploprion bifasciatum*, Cuv. and Val. ii. 21.


1
1 a
4
3
2
2 a
2 b

1 [illegible] carbunculus   3 Head of H. nigricans
2 Diploprion bifasciatum   4 [illegible]
Head of Enoplosus armatus

the two dorsal fins are far apart, and the preoperculum has a double indented edge. These are small fish, generally of a red colour.

There is one of them in the Mediterranean, commonly called king of the mullets, *(apogon rex mullorum,* Cuv. *Mullus imberbis,* Lin.) Cuv. Mem. du Mus. i. 336. and pl. xi. f. 2. 3 inches long, red with a black spot on each side the tail[1].

CHEILODIPTERUS, *Lacép.*

Unite all the characters of the apogons, and differ from them only by the hooks, or long and pointed teeth with which their jaws are armed.

They are fish of the Indian seas; of small size, and for the most part, striped longitudinally[2].

POMATOMUS, *Riss.*

Have, like the apogons, two distant dorsal fins, and scales, which fall off with equal facility, but their preoperculum is simply striated, their operculum emarginated, and the eye enormous. They have their teeth like the pile of velvet.

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[1] It is the *Apogon rouge,* of Lac. The *Corvulus,* Ges. p. 1273. *Amia* Gronov. Zooph. ix. 2. *Centropomus rubens,* Spinol. An. Mus. x. 28. 2. *Dipterodon ruber,* Rafin. Caratt. N. 715, &c. the *Dipterodon héxacanthe,* Lac. iii. pl. iv. f. 2. and the *Ostorinque fleurieu,* id. iii. 32. 2. belong also to this genus. For many foreign apogons, see Cuv. and Val. ii. 151. and the following.

[2] *Cheilod. octovittatus,* Cuv. Lacép. iii. 34. 1. which is also his *Cheilod. rayé,* iii. p. 543. and his *Centropome macrodon,* iv. 273. *Cheilod. arabicus (Perca lineata,* Forsk.) Cuv, and Val. ii. pl. xxiii. *Ch. quinquelineatus,* ib. p. 167.

Only one species is known proper to the Mediterranean ; but excessively rare. (*Pomat. telescope,* Risso.) Cuv. et Val. ii. 24.

A second subdivision includes the percoïdes with two dorsal fins, and with long and pointed teeth, mixed with their velvety teeth.

AMBASSIS, *Commers.*

Have nearly the shape of the apogons ; their preoperculum has a double indentation toward the base, their operculum terminates in a point, but they are distinguishable from the apogons, by having the two dorsal fins contiguous, and by a recumbent spine in front of the foremost.

Possibly they may not altogether belong to this family ; for their intestinal canal has no appendix to the pylorus.

They are small fresh water fish of India, which abound in the rivers and ponds there ; many of them are transparent [1].

There is one of them common in a pond in the Isle of Bourbon, which is prepared there like anchovies. (*Ambassis Commersonii,* Cuv. and Val. ii. 25. [2])

It is to this division that belongs

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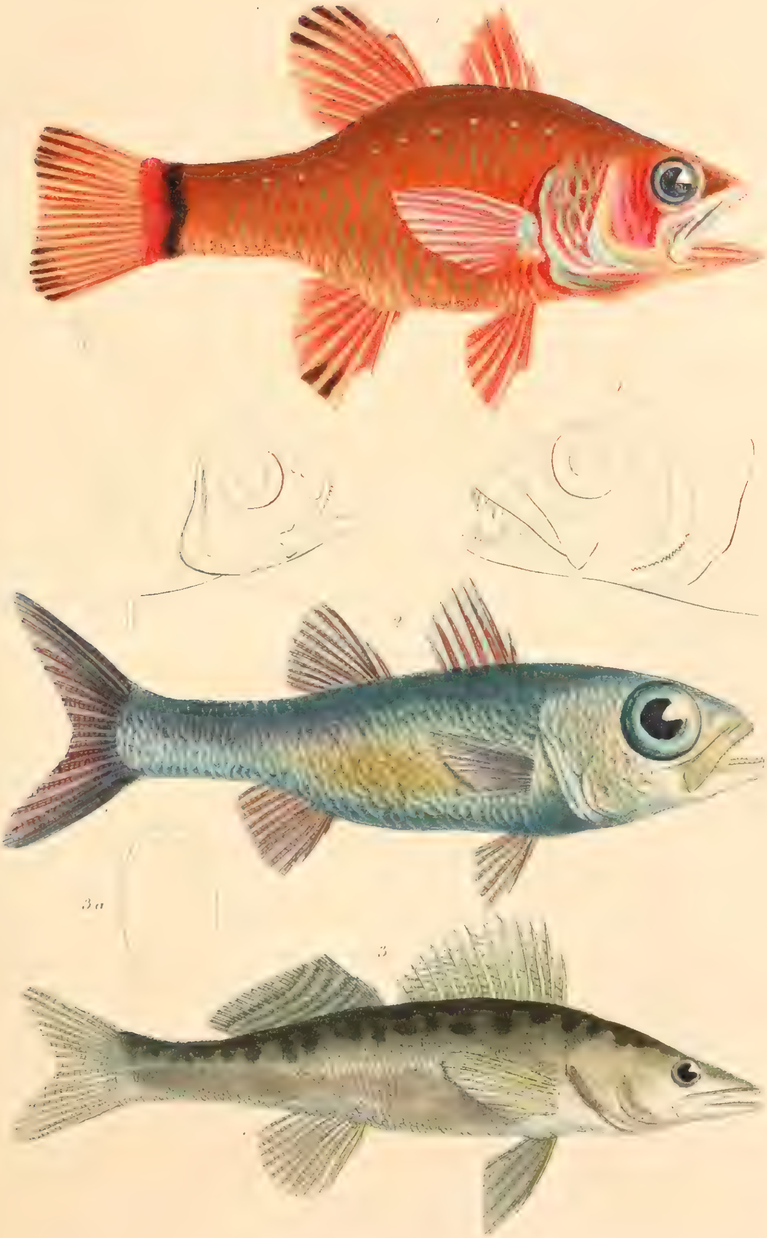
[1] Mr. Hamilton Buchanan inserts many of them in his *chanda.*

[2] It is the *Centropome ambasse,* Lac. iv. 273. and his *Lutjan gymnocephale,* iv. 216. and iii. pl. xxiii. f. 3. For other species, see Cuv. and Val. ii. 181. and the following.



1. *Apogon rex-mullorum.*
2 *Pomatomus telescopium*
3 *Lucioperca sandra*
4 *Head of Cheilodipterus* [illegible]
5 *Head of Ambassis* [illegible]

LUCIO-PERCA, *Cuv.-Pike-Perch.*

So named, because to the characters of the perch, they join teeth which have some relation to those of the pike. The edge of their preoperculum has merely a simple indentation; their dorsal fins are separated; some of their jaw and palatine teeth are long and pointed.

Luc. sandra, Cuv. *Perca lucio-perca*, Lin. Bl. pl. li. Cuv. and Val. ii. pl. xv.

Is an excellent fish of the lakes and rivers of Germany, and of Eastern Europe, longer than the perch, greenish, with vertical brown bands; it attains three or four feet in length[1].

A second division includes the percoïdes, with seven branchial rays, and a single dorsal fin. It may be subdivided on principles nearly analogous to those which form the basis of the subdivision of the preceding; teeth either bent or altogether level, indentations or spines to the opercular pieces, &c.

In the subdivision provided with hooked teeth,

SERRANUS, *Cuv.*

Have the preoperculum denticulated, and the bony operculum terminated with one or two points. It is a genus extremely numerous in species, and which may be subdivided as follows:

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[1] Add *Perca volgensis*, Gm. *Luc.-Perc. Americana*, Cuv. and Val. ii. pl. xvi. p. 122.

The SERRANI (properly so called) *commonly named* SEA PERCH.

In which the two jaws have no apparent scales.

The Mediterranean has some pretty species, as

Perca scriba, Lin. Cuv. and Val. ii. 28.

So named from some irregular blue stripes on the head[1].

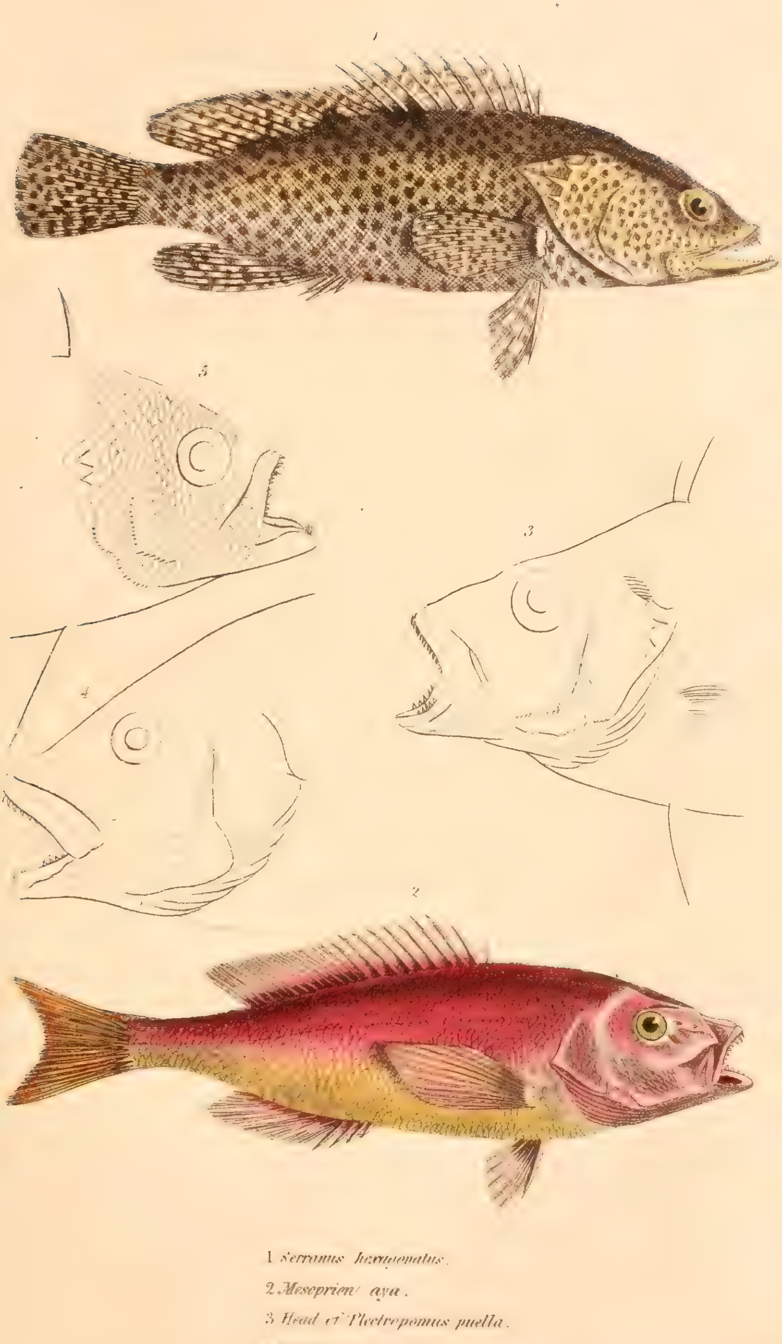
Perca cabrilla, Lin. Cuv. and Val. ii. 29.

With three oblique bands on the cheek[2]. It is also taken in the ocean. This species, and perhaps the preceding, was known to the Greeks under the name of *χανη*, and was said to have none but females. Cavolini indeed affirms that all the specimens he has observed had ovaries, and toward the lower end a whitish part which might be considered as the milt. He considers them capable of self impregnation.

---

[1] This is also the *Perca marina* of Brunnich, *Holocentrus marinus* of Laroche, *Hol. argus* of Spinola, and *Hol. maroccanus* of Bl. It appears to us also that *Hol. fasciatus*, Bl. 240, is merely a mutilated individual of this species.

[2] It is also *Hol. virescens*, Bl, *Serranus flavus*, and *cabrilla* of Riss. *Labrus chanus*, Gm., *Holocentre chani*, Lacep., the *Bodian hiatule* of the same, &c. Add *Labrus hepatus*, Lin., *Lab. adriaticus*, Gm., or *Hol. siagonotus*, Laroche, &c. *Serranus vitta*, Quoy and Gaym. Voy. de Freycin. Zool. 58. 2. *Hol. argentinus*, Bl. 235. 2. *Serr. radialis*, Q. and G. 316. *S. fascicularis*. Cuv. and Val. ii. 30, and the other species in Cuv. and Val. ii. p. 239—249.



1 *Serranus hexagonatus.*

2 *Mesoprion aya.*

3 *Head of Plectropomus puella.*

4 *Head of Serranus anthias.*

5 *Head of Diacope rivulata.*

[illegible]

ANTHIAS, Bl. in part.

Are serrani, whose jaws and the tip of the muzzle are armed with very apparent scales [1].

The most remarkable species is

Anthias sacer [2], Bl. pl. cccxv. Cuv. and Val. ii. 31.

Is a charming fish of a fine ruby red, changing into gold and silver, with yellow bands on the cheeks; the third ray of its dorsal fin elevates itself more than twice the height of the others; its ventral fins are greatly elongated, and the lobes of its caudal fins terminate in threads, the lowest of which is the longest [3].

The MEROUS.

Are serrani whose maxillary bone is without scales, but whose lower jaw is covered with small ones.

There is one in the Mediterranean.

---

[1] The greater part of our merous are also anthias of Bloch, but we limit this genus to the species with which our definition accords. Bloch has been so little particular that his *anthias sacer* has not even the characters attributed to the genus anthias, of an operculum without spines.

[2] This epithet was given by the ancients to their *anthias*, a large fish very different from this. See Cuv. and Val. ii. 255. and the following.

[3] Add *Serranus oculatus*, Cuv. and Val. ii. 32. and the other species there described. Ib. p. 262. 270.

Perca gigas, Gm.

Cloudy brown, three feet or more long. This is also taken in the ocean.

The foreign merous are extremely numerous. In many the denticulation of the preoperculum become nearly imperceptible [1]; but in general they can only be distinguished by their colours.

There are several whose body is sprinkled with colours, more or less bright [2].

Others have it sprinkled with crowded spots [3].

---

[1] These when their muzzle is naked, form the BODIANS of Bloch; they differ only in having this denticulation less marked, from the majority of the HOLOCENTRES of the same author. The holocentres take the name EPINEPHELUS when their muzzle is scaly, and in this case the bodians take that of CEPHALOPHOLIS. The LUTJANS and the ANTHIAS of Bloch, differ from the holocentres by not having spines on the operculum; in the former the muzzle is naked, in the latter it is scaly, but all these characters, little important in themselves, are very ill applied to the species.

[2] These are the *Jacob Evertsen* of the Dutch, such as *Bodianus guttatus*, Bl. 224. *Cephalopholis argus*, Bl. Schn. p. 61. *Bodianus bœnak*. Bl. 226. *Holoc. auratus*, id. 236. *Hol. cæruleo-punctatus*, Lacép. iii. 17. 2., &c. And in America *Perca guttata*, Bl. 312. or *Spare sanguinolent*, Lacép. iv. 4. 1. *P. maculata* Bl. 213. or *Spare Atlantique*, Lac. iv. 4. 1. *Johnius guttatus*, Bl. Schn. or *Bonaci-arara*, Parra, xvi. 2. *Lutjanus lunulatus*, Bl. Schn. or *Cabrilla*, Parra, 36. 1. *Bodianus guativere*, Parra v. *Holoc. punctatus*, Bl. 241. or *Pyra pixanga*, Marg. 152. *Gymnocephalus ruber*, Bl. Sch. 67. or *Caranna*, Marg. 147. *Bodianus apua*, Bl. 229.

[3] *Epinephelus merra*, Bl. 329. *Holocentre pantherin*, Lacép. iii. 27. 3. *Serranus bontoo* Cuv. Russ. 128. *Serr. suillus*, Russ.

Others are striped longitudinally [1], or barred across[2], or marbled in large masses [3], or divided into two colours [4], or finally tinted more or less uniformly [5].

Very few of them present characters to be drawn from very perceptible forms; nevertheless we will cite

Serr. altivelis, Cuv. and Val. ii. 32,

whose dorsal fin is capable of greater elevation than in the others; this species has round black spots on a bright brown ground.

Serr. phaëton, Ib. pl. xxxiv.

Has the two middle rays of the caudal fin united into a filament as long as the body.

We have separated from the serrani

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127. *Labrus leopardus,* Lacép. iii. 30. 1. *Holoc. salmonoïdes,* ib. 24. 3. *Bodianus melanurus,* Geoff. Eg. xxi. 1.

[1] *Sciæna formosa,* Shaw; Russel, 129.

[2] *Holo. tigrinus,* Bl. 237. Seb. iii. 27. *Hol. lanceolatus,* Bl. 242. 1. *Anthias orientalis,* id. 326. *Anthias striatus,* id. 324. which is also *anthias cherna,* Bl. Schn. Parra 24., and the *Spare chrysomelane,* Lacép.

[3] *Serranus geographicus,* Kuhl. Cuv. and Val. ii. p. 322.

[4] *Serranus flavo cæruleus,* Cuv., which is the *Holoc. gymnose* of Lacép. iii. 27. 2., his *Bodian grosse tête,* iii. 20. 2., and his *Holocentre jaune et bleu,* iv. p. 469. It is moreover the *Serran bourignon,* Quoy and Gaim. Voy. de Freycin. Zool. pl. lvii. 2.

[5] *Holoc. ongus,* pl. ccxxxiv. *Epinephelus marginalis,* Bl. 228. or *Holocentro résmare,* Lacép. iv. 7. 2. *Holoc. océanique,* Lacép. iv. 7. 3. *Epinephelus ruber,* Bl. 331.—For a description of many other unfigured species see the second volume of our history of Fish.

PLECTROPOMA, *Cuv.*,

which differ only in having the teeth, which are more or less numerous, of the lower edge of the preoperculum, directed obliquely forward, slightly resembling the teeth of a rowel of a spur[1].

And

DIACOPE, *Cuv.*

whose character consists of an emargination toward the bottom of the preoperculum, which receives a tuberosity of the interoperculum.

There are some fine and large species in the Indian seas[2].

MESOPRION, *Cuv.*,

Have, together with the characters of the teeth and fins of the serrani, and their denticulated preoperculum, an operculum terminated with an angle, blunt and not spinous [1].

---

[1] *Pl. melanoleucum*, Cuv., or *Bodian melanoleuque*, Lacép., or *Labre lisse*, id. iii. 23. 2., or *Bodian cyclostome*, ib. xx. 1. *Holoc. leopard*, Lacép. iv. p. 337. Cuv. and Val. ii. 36. *Bodianus maculatus*, Bl. 228. or *Plectropome ponctué*, Freycin. Zool. 45. 1. *Hol. unicolor*, Bl. Schn. Seb. iii. 76. 10. *Plect. puella*, Cuv. and Val. ii. 37. and the other species described in the second volume of the history of Fish.

[2] *Diac. Sebæ*, iii. 27. 2. and Russel, 99. *D. rivulata*, Cuv. Cuv. and Val. ii. 38. *D. macolor*, Cuv. Renard i. 9. 60. *D. octolineata*, Cuv., or *Holoc. Bengalensis*, Bl. 246. the same as the *Labrus octolineatus* of Lacép. iii. 22. 1., and as the *Sciæna kasmira*, Forsk.; *Hol. quinquelineatus*, Bl. 239, is a variety of it. *D. notata*, Cuv. Russel 98. *D. quadriguttata*, Cuv. or *Spare lepisure*, Lacép. iii. 15. 2. *D. calveti*, Quoy and Gaym. Frey. Zool. 57., and many other species described in our second volume of the history of Fish.

There are many fine species in the two oceans [2]; many of them are very large, and excellent eating.

We pass on to the percoïdes with seven branchial rays and one dorsal, which have the teeth even.

Acerina, *Cuv.*,

Are distinguished by concavities in the bones of the head, and by having small spines without denticulations on the operculum and preoperculum.

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[1] The majority of them are included in the genus *Lutjanus* of Bl., but were there mixed up with species of other families, as well sciænoïdes as labroïdes, of which we have made other genera.

[2] *Mesop. unimaculatus*, Russel 97, *Anthias Johnii*, Bl. 318. *Coius catus*, Buchan. 38. f. 30. *M. 5—lineatus*, Russel 110. *M. monostygma*, Cuv. Lacép. III. xvii. 1. *M. uninotatus*, Cuv., Cuv. and Val. ii. 39. Duham. p. 2. sect. 4. pl. iii. f. 2., and probably *sparus synagris*, L. Cat. ii. 17. 1. *M. buccanella*, Cuv., of which Bloch has taken the figure in Plumier, and having altered, has given it for the *Sparus erythrinus*, pl. cclxxiv. *Bod. aia*, Bl. 227., or *Acara aia*, Marg. 167. *Mes. chrysurus*, Cuv. and Val. ii. 40., which is also the *Sparus chrysurus*, Bl. 262., or *Acara pitamba*, Marg. 155., the *Anthias rabirrubia*, Bl. Schn. Parra xxii. 1., the *Spare demi-lune*, Lacép. iv. 3. 1., and the *Colas* of Guadaloupe Duham. sect. 4. pl. xii. 1. *M. cynodon*, Cuv., or *Anthias caballerote*, Bl. Schn. Parra 25. 1. *Anth. jocu*, Bl. Schn. Parra 25. 2. *Sp. tetracanthus*, Bl. 279., which is also the *Vivanet gris*, Lacep. iv. 4. 3., and the *Lutjanus acutirostris*, Desmar, *M. sillao*, Russ., 100. *M. lunulatus*, Cuv., Mungo Park, Trans., Lin. iii. 35. 6. *Lutj. erythropterus*, Bl. 249. *Lutj. lutjanus*, 245. *Sparus malabaricus*, Bl. Schn. *M. rangus*, Cuv., Russel 94. *M. rapilli*, id. 95. *Alphestes gembra*, Bl. Sch. pl. li. 2. and the other species described in our second volume.

There are two in the fresh waters of Europe.

Perca cernua, Lin. Bl. 53. 2., Cuv. and Val. iii. pl. xli.

Is a small fish of good flavour, found in all our fresh waters; rather olive, spotted with brown.

Perca Schraitzer, L. Bl. 332.

Is found in the Danube; is larger, and has on the sides blackish interrupted lines[1].

RYPTICUS, *Cuv.*

Have also only small spines on the operculum, and their scales moreover, like those of grammistes, are small, and hidden under a thick epidermis. The single dorsal fin distinguishes them especially from the grammistes.

There is one in America of a blackish violet, (*anthias saponaceus*, Bl., Sch.), Parra xxiv. 2., to which its soft skin, endowed with a frothy viscosity, has given the name of *savonnier*[2], or soap maker.

POLYPRION, *Cuv.*

Have not only denticulations on the preoperculum and spines to the operculum, but there is also on the latter bone a furcated crest, very sharp, and in general the bones of their head have much asperity.

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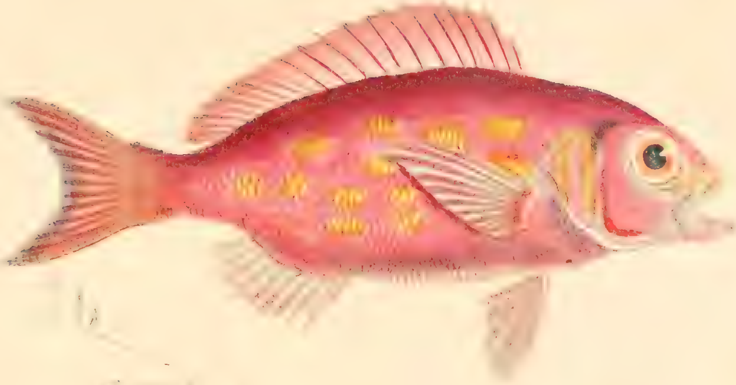
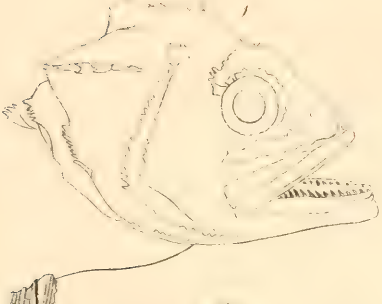
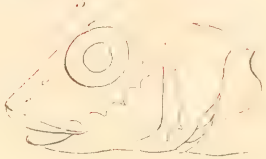
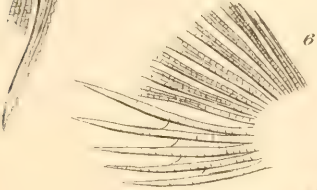
[1] Add *Perca acerina*, Guld. Nov. Com. Petrop. xix. 455.

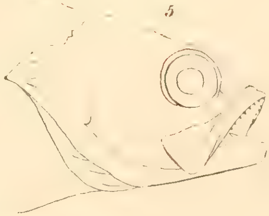
[2] Add *Rypticus arenatus*, Cuv. and Val. iii. pl. xlvi.

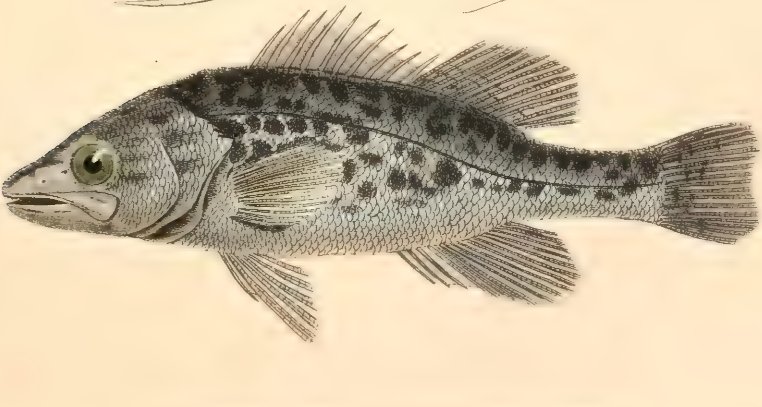












1 *Centropristes aurorubens.*
2 *Gristes macquariensis.*
3 *Head of Acerina vulgaris.*
4 *Head of Polyprion cernium.*
5 *Head of Rypticus arenatus.*
6 *Fin of Cirrhites fasciatus.*

London, Published by Whittaker & Co. Ave Maria Lane [illegible]

The Mediterranean possesses a species which becomes enormous, and is shaded with brown on a lighter ground, (*Polyprion cernium,* Valenc,) Mém. du Mus. t. xi. p. 265. Cuv. and Val. iii. pl. xlii [1].

CENTROPRISTRIS, *Cuv.*

Have all the characters of serrani, except that they are destitute of canine teeth, and have all their teeth even. Their preoperculum is denticulated and the operculum spinous.

The United States have one which becomes large, and in which the caudal fin when young is trilobate. It is their *black perch,* (*Centropristris nigricans,* Cuv.) *Coryphæna nigrescens,* Bl. Sch., Cuv. and Val. iii. pl. xliv. It is blackish brown [2].

GRYSTES, *Cuv.*

Differ from the last only in having the preoperculum entire and not denticulated at the edges [3].

The genus PERCA terminates here, such as it has been defined by Artedi and Linnæus; but there are many fish which approximate to this genus, although certain characters oblige us to make separate genera of them.

---

[1] *Am. australis,* Bl. Schn. pl. xlvii., or *Americanus,* ib. p. 205., and *Am. oxygeneios,* ib., or *Perca prognathus,* Forst., do not appear to us distinguishable from the *P. cernium.*

[2] It is also the *Lutjan trilobé,* Lacép. II. xvi. 3., and the *Perca varia,* Mitchill, New York Trans. Add *Perca trifurca,* L. *Scorpéne de Waigiou,* Quoy. and Gaym , Freycin. Zool. 58. 1., and the other species described in our third volume of the history of Fish.

[3] *Labre salmoïde,* Lacép. IV. v. 2., or *Cychla variabilis,* Lesueur, Sc. Nat. Phil., Cuv. and Val. iii. pl. xlv. *Gr. Macquariensis,* ib. p. 58.

We begin with the percoïdes with less than seven branchial rays. These may also be subdivided according to the number of their dorsal fins and the nature of their teeth.

In those with a single dorsal fin some are found which, amongst others, have hooked teeth; these are

CIRRHITES, *Commers.*

Which, like the mesoprions, have the preoperculum denticulated, and the operculum terminated in a blunt angle, and are to be distinguished by having the lower rays of the pectoral fins, which are thicker and not branched, extending a little beyond the membrane. They have only six rays to the gills. All of them inhabit the Indian seas[1].

Other of these percoides with less than seven branchial rays, have none but even teeth, or at least, are destitute of hooked teeth.

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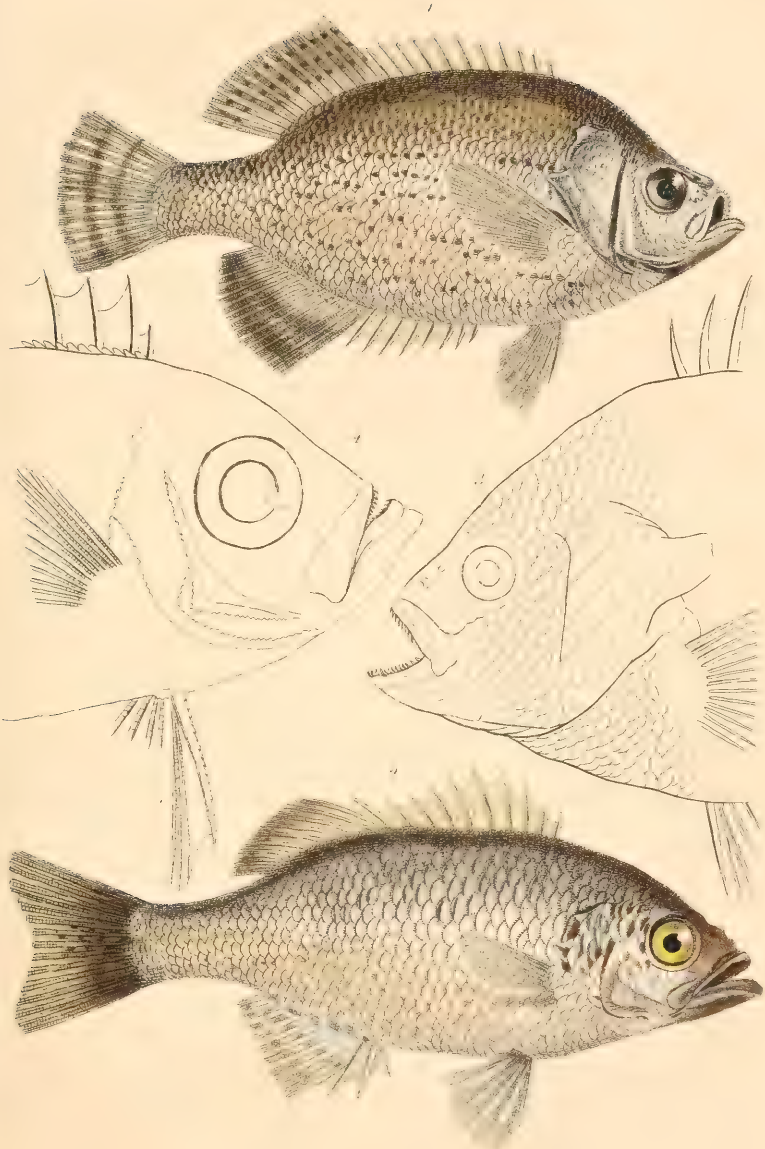
[1] *Cirrhite tacheté*, Lacép. v. 3. which is also his *Labre marbre*, III. v. 3. and p. 192. *Cirrhite pantherin*, or *Spare pantherin*, ib. iv. 6. 1. and p. 160. and Seb. iii. 27. 12. *Cirrhites vittatus*, Cuv. Renard i. 18. 102. *Cir. aprinus*, Cuv. and Val. iii. 47., &c.



1 *Centrarchus sparoides*

2 *Dules rupestris*

3 *Head of Pomotis vulgaris*

4 *Head of Priacanthus japonicus*

[illegible]

CHIRONEMUS, *Cuv.*

Have at the lower part of the pectoral fins, the same simple rays as the cirrhites[1].

POMOTIS, *Cuv.*

Are fish with a compressed oval body, whose character consists of a membranaceous elongation at the angle of the operculum. They inhabit the fresh waters of America[2].

CENTRARCHUS, *Cuv.*

Have, with the characters of the last, numerous spines to the anal fin; and moreover their tongue has a group of even teeth. They are from the same country[3].

PRIACANTHUS, *Cuv.*

Have an oblong compressed body entirely covered, as well as the head, and even the jaws, with small rough scales; the preoperculum is denticulated, and its salient angle is in form of a spine, itself denticulated. They are found in the seas of warm countries[1].

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[1] Only one is known, of New Holland; *Chironemus georgianus*, Cuv. and Val. iii. p. 78.

[2] *Pomotis vulgaris*, Cuv. or *Labrus auritus*, Lin. called the *pond perch* in the United States, Catesb. ii. 8. 2. Cuv. and Val. iii. pl. xlix.

[3] *Centrarchus æneus*, Cuv. or *Cychla ænea*, Lesueur. Sc. Nat. Phil. *C. sparoïdes*, or *Labre sparoïde*, Lacép. iii. 24. 2. *Labre iris*, Lac. iv. 5. 3. which is also his *Labre macroptère*, iii. 24. 1.

DULES, *Cuv.*

Have, like centropristres, the operculum terminated in a spine, the preoperculum is denticulated, and the teeth are even; but their branchial membrane has only six rays[2].

There is one, *D. rupestris,* Cuv. in the fresh waters of the Isle of Bourbon, and the Isle of France, something like a carp, and esteemed for its flavour[3].

THERAPON, *Cuv.*

Have a denticulated preoperculum, the operculum is terminated by a strong spine; only one dorsal fin with a deep depression between the spiny and the articulated parts; the exterior range of teeth are stronger than the others, and pointed. In some the teeth of the vomer fall early. They are Indian fish, remarkable for having the swimming-bladder naturally divided into two by a ligature[4].

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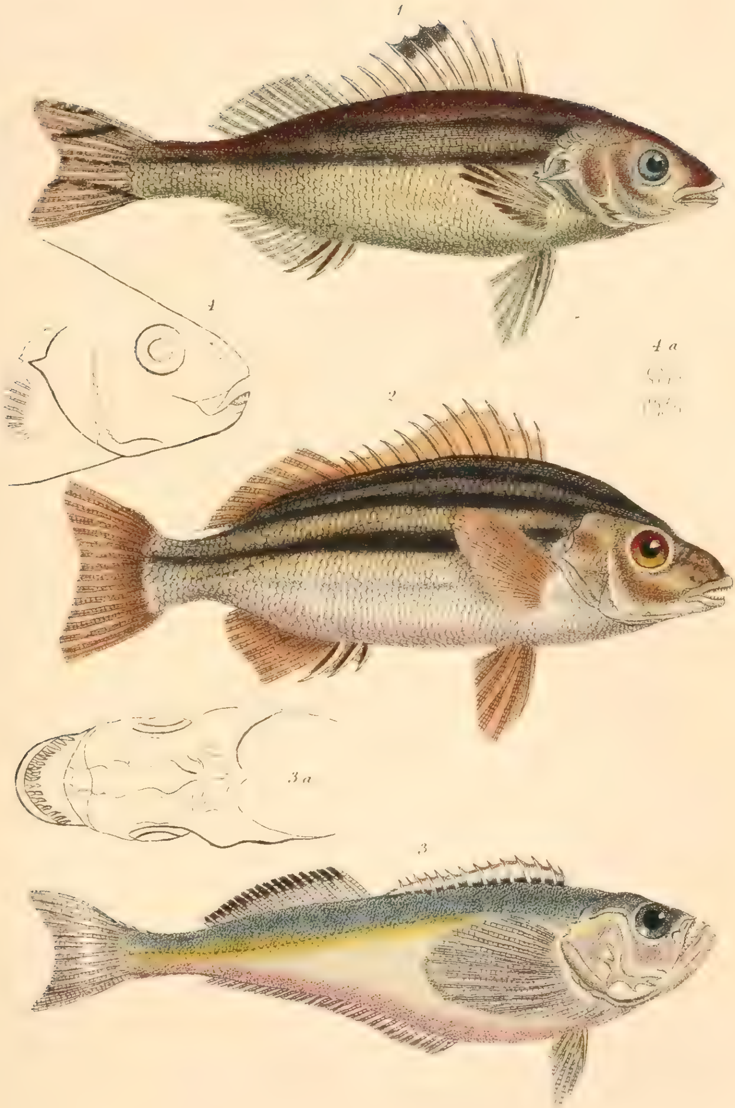
[1] *Anthias macrophtalmus*, Bl. 319. or *Catalufa*, Parra. xii. 1. *Anthias boops*, Bl. Schn. 308. *Sciæna hamruhr*. Forsk. *Labrus cruentatus*, Lacép. iii. 2. 2. and the other species described in our third volume.

[2] *Dules auriga*, Cuv. and Val. iii. 51. *D. tæniurus*, ib. 53. and the other species described in our third volume.

[3] *Centropome de Roche*, Lacép. iv. 273.

[4] *Holocentrus serrus*, Bl. 238. 1. or *Sciæna jerbua*, Forsk. *Hol.*



1 *Therapon puta.*

2 *Pelates quadrilineatus.*

3 *Tricheden Stelleri*

4 *Head of Helotes sexlineatus.*

London, Published by Whittaker & Co. Ave Maria Lane 1834

We can scarcely separate the DATNIA from these, although they are destitute of palatine teeth, the profile is more rectilinear, and their dorsal fin less emarginated [1].

PELATES, *Cuv.*

Have the same characters as to the operculum, and the interior as the last; but their teeth are uniformly even, and their dorsal fin is but little emarginated [2].

HELOTES, *Cuv.*

Still very similar, have the dorsal fin strongly emarginated, and are particularly distinguishable, by having the foremost range of teeth trilobate [3].

Most of these fish have longitudinal blackish lines in a silvery ground.

The percoides, with less than six branchial rays, and with two dorsal fins, include only two genera.

TRICHODON, *Steller.*

In which the preoperculum has some strong spines,

4.—*lineatus*, Bl. 238. 2. *Ther. puta*, Cuv. Russel, pl. cxxvi. *Ther. theraps*, Cuv. and Val. iii. 53. and the other species described in our third volume.

[1] *Datnia Buchanani*, or *Coius datnia*, Buchanan, pl. ix. f. 29. and Cuv. and Val. iii. 55. *Datnia cancellata*, ib. p. 144.

[2] *Pelates quinque lineatus*, Cuv. and Val. iii. 56.

[3] *Helotes sexlineatus*, Cuv. and Val. iii. 57. or *Esclave six lignes*, Quoy and Gaym. Voy. du Freyc. Zool. 70. 1.

and the operculum is terminated in a flat point. They have no scales; their mouth is cleft almost vertically. Only one is known.

Tr. Stelleri, Cuv. *Trachinus trichodon*, Pall. Mem. de Perers. iv. 15. 8. Cuv. and Val. iii. 57.

From the northern part of the Pacific ocean[1].

SILLAGO, *Cuv.*

With the head a little elongated towards a point, the mouth small, the teeth even in the jaws, and on the front of the vomer; the operculum terminating in a small spine, six branchial rays, two contiguous dorsal fins, the anterior with slender spines, the posterior long, and but little elevated.

These are fish of the Indian seas, very much esteemed for their flavour, and the lightness of their flesh.

The most remarkable species is

Sillago domina, Cuv.

Brownish, and is distinguished by having the first ray of the dorsal fin elongated into a thread as long as the body. Its head is scaly, and the eye very small.

There is another,

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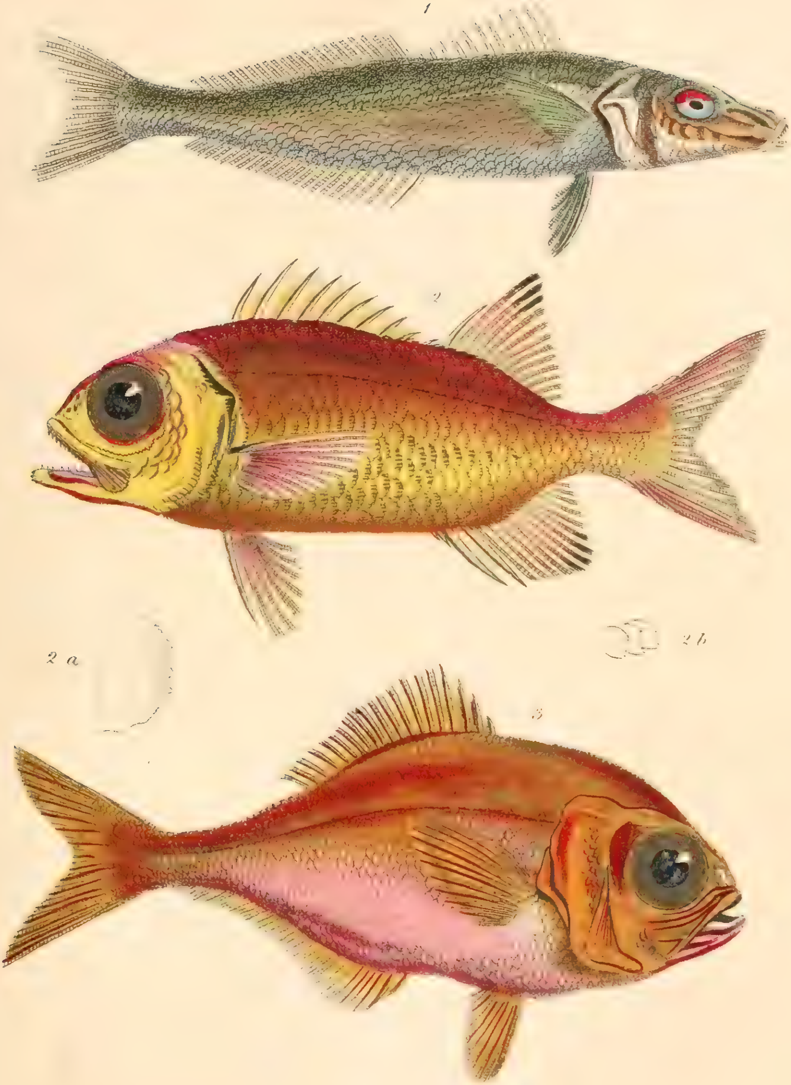
[1] This fish having neither jugular ventrals, nor an elongated posterior dorsal fin, nor a strong spine on the operculum, nor seven rays to the gills, cannot be a *trachinus* as Pallas and Tilesius thought.



1 *Sillago erytheræa.*

2 *Myripristis seychellensis*

3 *Beryx decadactylus*

London, Published by W. [illegible] Maria Lane 1834

Sciæna Malabarica, Bl. Schn. 19. *Soring*, Russel. 113.

About a foot or more long, fulvous. It is considered one of the best Indian fish[1].

We pass on to the percoïdes, having more than seven branchial rays. Three genera of them are known, all having this particularity, that their ventral fins have a spine and seven or more soft rays; while in the other acanthopterygii there are not more than five soft rays.

HOLOCENTRUM[2] *Artedi.*

Are fine fish, with brilliant and denticulated scales, whose operculum is spiny and denticulated, and the preoperculum not merely denticulated, but has at its angle a strong spine directed backward. They are found in the warm parts of both oceans[3].

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[1] *Atherina sihama*, Forsk. or *platicephalus sihamus*, Bl. Sch. Rüppel. pois. pl. iii. f. 1. *Sillago maculata*, Quoy and Gaym. Freycin. pl. iii. f. 3.

[2] N.B. We restrict this genus to the species which correspond with the definition of it given by Artedi. Seb. iii. ad tab. 27. 1. and we give as he does to this name, a neuter termination, in order that it may not be confounded with the *holocentrus* of Bl. and Lacép. in which are mixed up many other species, and especially serrani.

[3] *Holocentrum longipinne*, Cuv. which is *Hol. sogho*, Bl. 232. and his *Bodianus pentacanthus*, or the *Jaguaraca* of Marg. 147.; it is also *Sciæna rubra*, Bl. Sch. Cates. ii. 2. 2. and *Amphiprion matejuelo*, Bl. Sch. Parra. xiii. 2. *Hol. orientale*, Cuv. Seb. iii. 27. 1. *Hol. rubrum*, Bennett. Fishes of Ceylon pl. iv. *Hol. leo*, Cuv. Ren. 1. 27. 148. a very bad figure. *Sciæna spinifera*, Forsk. *Hol. hastatum*,

blackish spots, blue stripes, and yellow tints; there are thirty rays to the second dorsal fin, and some oblique stripes on the flanks.

We have one species smaller than the last.

Trachinus vipera, Cuv., *Otter pike* of the English, Pen. 28. Bl. 61.

Under the name of *common weaver*, paler, with the flanks smooth, and twenty-four rays to the second dorsal fin. It is still more feared than the common species, because, being smaller, one is more liable to be pricked by it. The Mediterranean has moreover

Trach. araneus, Riss. Salvian 71., copied by Willughb. pl. s. 10. f. 2.

Higher, with twenty-eight rays to the second dorsal fin, and six or eight black spots along the flanks; and

Trach. radiatus, Cuv., Cuv. and Val. iii. 72.

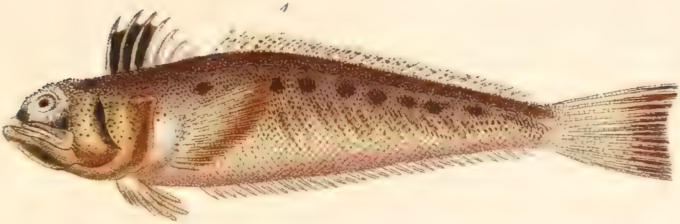
With twenty-five rays to the second dorsal fin, the head grained and rough; large black rings alternate with full spots on the flanks.

We know of no trachini from distant seas.

PERCIS, *Bl.*, *Sch.*

Represent the last in some measure in the seas of hot countries. Their principal difference consists in having the head depressed and some hooked teeth in front of their jaws and vomer, but they have them

1



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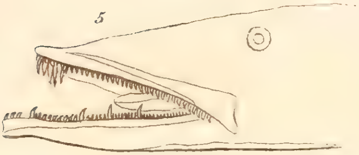

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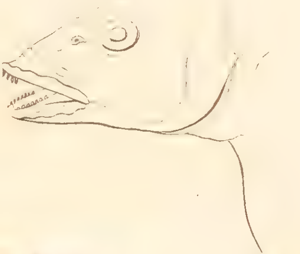

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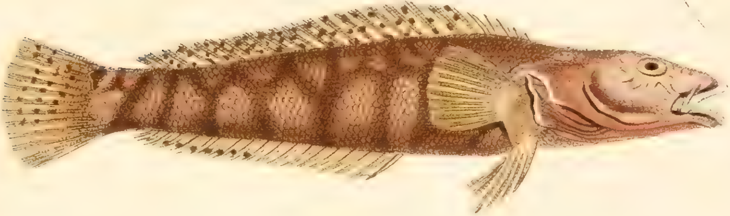

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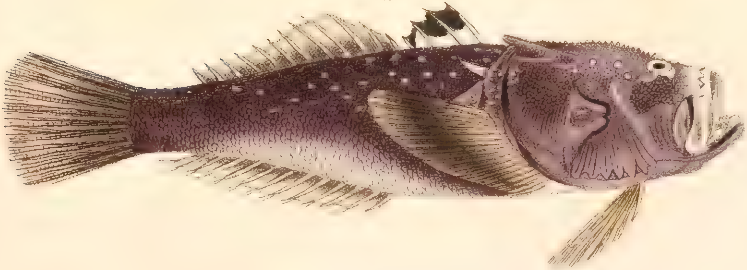

1 *Trachinus araneus*

2 *Percis cancellata.*

3 *Uranoscopus guttatus*

4 *Head of Pinguipes Brasilianus.*

5 *Head of Percophis Brasilianus.*

[illegible] Whittaker & C° Ave Maria Lane [illegible]

not on the palate ; their first little dorsal fin is more united to the larger one which succeeds it[1].

PINGUIPES, *Cuv.*

Have a still heavier form than the percis ; the teeth are strong and conical, the lips are fleshy, and there are teeth to the palate ; their ventral fins are thick.

Only one is known, which belongs to Brazil,

Ping. Brasilianus, Cuv. and Val. iii. 74.

PERCOPHIS, *Cuv.*

Have, on the contrary, the body much elongated, a part of their teeth are long and very pointed : the point of their lower jaw juts forward.

Only one species also of the Brazils

Percoph. Brasilianus, Cuv., *Perc. Fabre,* Quoy and Gaim., Voy. de Freycin. Zool. 53. 1. 2.

One of the most remarkable genera of the jugular percoïdes is that of

URANOSCOPUS, *Lin.*

So named because the head, nearly cubical in shape, has the eyes at the upper surface so that they are directed toward the sky; their mouth also is cleft vertically, their preoperculum is notched toward the bottom, and they have a strong spine at each shoulder; their gills have only six rays. Within the mouth and before the tongue is a long and narrow shred, which they can put out at pleasure, and which, as it is said, when they are hidden in the soft mud, they make use of as bait for little fish. One remarkable particularity of their anatomy is the great size of their gall-bladder, which was known to the ancients[1].

---

[1] *Percis maculata,* Bl. Sch. pl. xxxviii. *P. semifasciata,* Cuv. and Val. iii. 73. *P. cylindrica,* or *Sciæna cylindrica,* Bl. 299. 1. which is also *Bodianus Sebæ,* Bl. Schn., Seb. iii. 27. 16. *P. cancellata,* Cuv., or *Labre tetracanthe,* Lac. iii. p. 473. and ii. pl. xiii. f. 3. which is also his *Bodian tetracanthe,* iv. 302. *P. ocellata,* Renard. I. vi. 42. *P. colias,* Cuv., or *Enchelyopus colias,* Bl. Sch. p. 54. and the other species described in our third volume.

In some the first dorsal fin, small and spiny, is separated from the second, which is soft and long.

Uranoscopus scaber, Lin., Bl. 173.

Is grey brown with irregular series of whitish spots. This is one of the most deformed fish, but is nevertheless eaten.

There are some very similar to this in the Indian seas and at Brazil[2].

Others have only a single dorsal fin, or the spiny part is joined to the soft part. They are all foreign species[3].

---

[1] Arist. Hist. An. lib. ii. c. 15.

[2] Add *Uranosc. affinis*. *Ur. marmoratus*. *Ur. guttatus*. *Ur. filibarbis*. *Ur. Y græcum*, new species described in our third volume.

[3] *Uran. lebeck*, Bl. Schn. p. 47. *Ur. monopterygius*, ib. 49. *Ur. lævis*, ib. pl. viii. *Ur. inermis*, Cuv. and Val. iii. 71. *Ur. cirrhosus*, two new species.

A third division of the percoïdes has the ventral fin attached more posteriorly than the pectoral. These are the ABDOMINAL PERCOÏDES.

Their first genus is

POLYNEMUS, *Lin.*

So named because many of the lower rays of their pectoral fins are free, and form so many filaments, (from *νημα, filum.*) These have not the ventral fins very much behind, and their pelvis is even still suspended to the bones of the shoulder. They belong to the percoïdes by the even teeth with which their jaws, vomer, and palate are furnished; but they have their muzzle gibbous, and their vertical fins scaly, like many of the sciænoïdes; their two dorsal fins are separated; the preoperculum is denticulated, the mouth very much cleft. There are some of them in all the seas of warm climates.

Pol. paradiseus and *Pol. quinquarius,* Lin., Seb. iii. 27. 2. Edw. 208. Russel 185.

Also called *Mango-fish,* on account of its fine yellow colour, has seven filaments on each side, the first of which are twice the length of the body. This species is destitute of the air-bladder, but the others have one. It is the most delicious of the fish eaten at Bengal.

The other polynemi have the filaments shorter than the body, and the number of these filaments constitute one of the characters of the species. Some of them are large, and all are considered good eating[1].

In the following genera the ventral fins are altogether behind, and the pelvis is not attached to the shoulder.

The first of these genera had for a long time been confounded with that of the pikes; this is the genus

SPHYRÆNA[2], *Bl., Sch.*

Large, elongated fish, with two distinct dorsal fins, and the head oblong, with the lower jaw coming to a point in front of the upper; part of the teeth are large, pointed, and trenchant. The preoperculum has no denticulations, nor has the operculum any spines; there are seven rays to the gills, and numerous appendices to the pylorus.

We have one species in the Mediterranean,

Esox sphyræna, Lin., *Sphyrène spet*,[3] Lacép., Bl. 389.

Which attains to more than three feet in length, and

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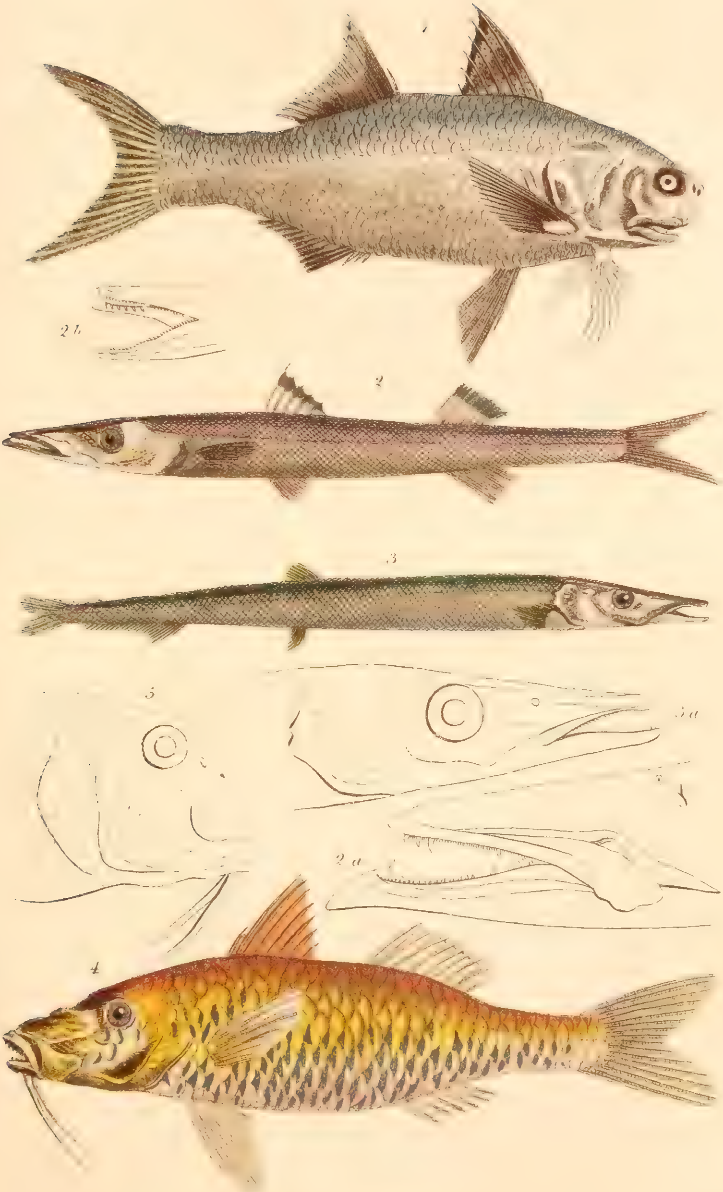
[1] *Polyn. plebeius*, or *Emoï*, Brouss., Bl. 400. *Pol. uronemus*, Cuv., Russell 184. *Pol. tetradactylus*, Shaw, Russel 183. *Pol. sextarius*, Bl. Schn. pl. iv. *Pol. enneadactylus*, Vahl. *Pol. decadactylus*, Bl. 401. *Pol. Americanus*, Cuv., which is the Polyneme, improperly named paradisæus by Bl. pl. 402., and of which M. de Lacép. has improperly also made a particular genus, his *Polydactyle plumier*, v. 14. 3.

[2] *Σφύραινα, a dart.*

[3] *Espeto*, a *spit* in Spanish. The name is given in allusion to its long and sharp form.



1 *Polynemus enneadactylus*

2 *Sphyræna vulgaris*

3 *Paralepis coregonoides Risso.*

4 *Upeneus luteus*

5 *Head of Mullus barbatus*

London, Publish'd by Whittaker [illegible]

is bronzed on the back and silvery under the belly. The young have brown spots.

America has one of them nearly allied; *(Sph. picuda,* Bl. Schn.,) Parr. xxxv. 5. 2., Lacep. v. 9. 3.

And another, which becomes still larger, and which is feared nearly as much as the shark, (*Sph. barracuda,* Cuv., Catesb. ii. pl. i. f. 1.)

PARALEPIS, *Cuv.*

Are small fish, similar to the sphyrænæ, but whose second dorsal fin is so small and so brittle that it has been thought to be adipose[1].

MULLUS, *Lin.*

Are nearly attached to the percoïdes by many exterior and anatomical details, and may nevertheless form a separate family of themselves, from having such remarkable particularities.

Their two dorsal fins are much separated; the whole body and the opercula are covered with large scales, which easily fall off; the preoperculum has no denticulations; their mouth is but little cleft, feebly armed with teeth, and they are more particularly distinguishable by having two long barbels attached to the symphysis of the lower jaw.

They are divided into two subgenera.

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[1] There are in the Mediterranean two or three small species discovered by M. Risso. See his second edition, fig. 15, 16.

MULLUS, properly so called,

Have only three rays to the gills, and the operculum is without spines and the upper jaw is without teeth, but the vomer has two large plates of small teeth closely set; they have no air-bladder.

All the species are European.

M. barbatus, Lin., Bl. 348. 2.

With a profile nearly vertical, of a fine bright red, is celebrated for its flavour, and for the pleasure the Romans took in contemplating the changes of colour it undergoes in dying (Senec. Quest. Nat. iii. c. 18.)

It is more known in the Mediterranean.

M. *surmuletus*, Lin., Bl. 57.

Larger, and with the profile less vertical, striped longitudinally with yellow; more common in the ocean.

UPENEUS, *Cuv.*

Have teeth in both jaws, and are frequently without them on the palate; their operculum has a small spine; there are four rays to the gills, and they possess an air-vessel. All the species come from the seas of the warm climates[1].

---

[1] *Mullus vittatus*, Gm., Lacép. iii. 14. 1. Russel ii. 158. *M. Russelii*, Cuv., Russel ii. 157. *M. bifasciatus*, Lacép. iii. 14. 2. *M. trifasciatus*, id. iii. 15. 1., or *M. multibande*, Quoy and Gaym. Voy. de Freycin. pl. lix. f. 1. and many others described in the third volume of our history of Fish.

The second family of the acanthopterygii,

FISH WITH ARMED CHEEKS.

Contains a numerous series of fish, to which the singular appearance of their head, variously bristled and covered with armour, gives a peculiar physiognomy, and has caused them always to be classed in special genera, although they have many things in common with the perch. Their general character consists in having the suborbital bone more or less extended over the cheek, and articulated behind with the preoperculum. The genus urancoscopus, of the preceding family, is the only one which approximates to these; but in them the suborbitals, though very large, are attached behind to the temporal bones, and not to the preoperculum.

Linnæus made three genera of them, *Trigla, Cottus,* and *Scorpæna;* but it is necessary to subdivide them, and a part of his gasterostrei should be joined to them.

TRIGLA[1], *Lin.*

Are those who have this character most marked; their enormous suborbital bone entirely covers the cheek, and is articulated even by an immoveable suture to the preoperculum, which cannot move without it. The sides of the head, nearly vertical, give it a form approaching to a cube or parallelopiped, and its bones are all hard and granulated. The back has two distinct fins, and there are under the pectoral fin three free rays. They have about a dozen cœca, and a large and bilobate air-vessel. Many species utter, when taken, sounds, which have caused them to be named *grumblers.*

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[1] Τρίγλη was the Greek name of the Mullet. Artedi united these two genera, and since they have been separated this name has been left to them.

TRIGLA, properly so called, *Cuv.*

Have teeth in the jaws, and on the front of the vomer, which are even. Their pectoral fins, though large, are not sufficiently so to carry them out of the water. We have many species in our seas.

Trigla pini, Bl. 355., *Trig. cuculus*, L.?

Have along each side of the body numerous vertical and parallel lines, which cross the lateral line, and are formed by folds of the skin, in each of which is a cartilaginous plate. The muzzle is oblique. It is a fish of good flavour, and of a fine red colour.

Tr. lineata, Lin., *Tr. Adriatica*, Gm., Bl. 35. Rond. 295. Marten's Voy. to Venice, ii. pl. ii.

Has the muzzle much more vertical, and the pectoral fins longer; the lines of the flanks entirely surround the body, like rings. It is found in our markets, like the last, and the people erroneously take it for the female of the preceding species.

Tr. hirundo, L., Bl. 60. The *Tr. cuculus* of Brünnich.

Without furrows or spines on the sides; the back is

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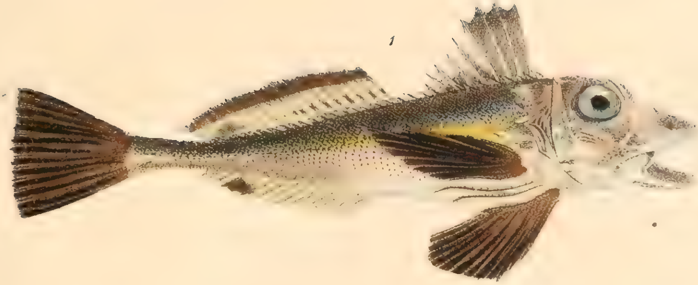

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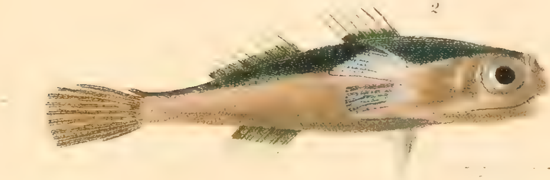

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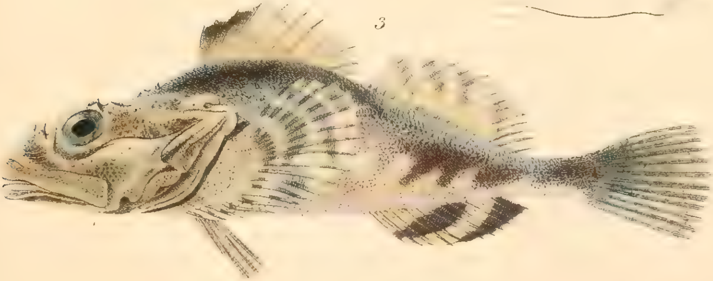

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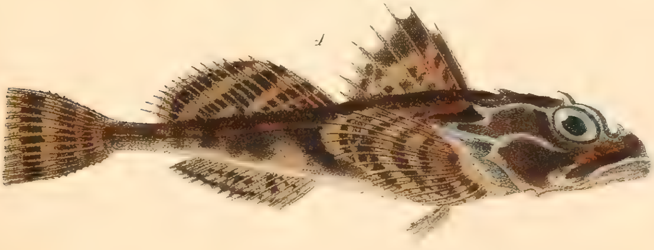

1 *Trigla pœciloptera.*

2 *Cephalacanthus spinarella*

3 *Cottus porosus*

4 *Cottus octodecim-spinosus*

[illegible]

brownish, sometimes reddish; the pectoral fins are black for one-fourth of their length, edged with blue on the internal side: it is the largest species of our coasts; some of them occur more than two feet long. They are salted.

Some allied species are found in India. They are new, and will be described in the fourth volume of our history of Fish.

Tr. lyra, L., Bl. 350. Rond. 298.

With the muzzle divided into two denticulated lobes; a strong spine to the operculum, to the suprascapular, and especially the humeral; spines along the dorsal fins, the lateral line smooth; the pectorals are one-third their length. It is a fine fish, bright red above and silvery white underneath.

Tr. gurnardus, Lin., Bl. 58.

With a pointed spine on the operculum and on the shoulder, subquadrate scales on the lateral line; it is in general grey brown above, spotted and white underneath; but there are some redish, and others red. It abounds more than the others in our markets.

There is a neighbouring species.

Tr. cuculus[1], Bl. 59.

Constantly red, with a black spot on the first dorsal fin.

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[1] It is here the *Tr. hirundo* of Brünnich; but it is neither the *cuculus* nor *hirundo* of Lin.

Tr. lucerna[1], Brünn. Rond. 287.

Has the lateral line furnished with scales, which are higher than they are wide, and the second dorsal spine elongated into a thread.

Tr. aspera, Viviani, Rondel 296.

With the muzzle short, the scales sharp, the head tufted; sharp crests along the dorsal fins; the temporal bones emarginated.

The two last species are small, and belong to the Mediterranean[2].

M. de Lacépède has separated three genera from Trigla.

PRIONOTES.

American fish, similar to the sapphirine gurnard (*trigla hirundo,*) with the pectoral fins nevertheless larger, and which can even sustain them in the air; but whose precise character consists in having a band of even teeth on each palatine bone[3].

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[1] This is not *T. lucerna* of Lin., but is his *Tr. obscura,* described Mus. Ad. Fred. part ii., and finally forgotten. *Tr. lucerna,* Lin. is a fictitious species.

[2] Add *Tr. papilio,* Cuv. *Tr. phalæna.* *Tr. sphinx,* described in our fourth volume.

[3] *Tr. punctata,* Bl. 352. and 354. *Tr. strigata,* Cuv., *evolans,* Lin. *Lineata,* Mitchill, New York Trans. i. pl. iv. f. 4. *Tr. Carolina,* L., or *palmipes,* Mitch. loc. cit. *Tr. tribulus,* Cuv.

Peristedion, *Lacép.*

Have been separated from trigla with still more reason. Their whole body is covered with large hexagonal scales, which form longitudinal crests; the muzzle is divided into two points, and carries under it some branched barbels. Their mouth has no teeth.

Only one species is well known, which belongs to the Mediterranean, *Tr. cataphracta*, Lin., Rondel, 299. Red, about a foot long. Block's figure of it, 349, is faulty, and gives too many rays to the second dorsal fin. There are in India many other species.

The best warranted of these separations is

Dactyloptera, *Lac.*

So much celebrated under the name of flying fish; the rays under their pectorals are much more numerous and larger, and instead of being free, as in the preceding genera, they are united by a membrane into a supernumerary fin, larger than the fish itself, and which supports them in the air for some length of time; hence they are seen flying above the water to escape the bonitoes and other voracious fish, but they fall in at the end of a few seconds.

Their muzzle, which is very short, appears to be cleft like the lip of a hare; their mouth is situated underneath; there are only in the jaws certain rounded teeth arranged like pavement: their skull is flat, rectangular, and granulated; the preoperculum is terminated by a long and strong spine, which forms a powerful weapon. All their scales are carinated.

The Mediterranean species (*Trigla volitans,* Lin., Bl. 351.) is a foot long, brown above, reddish underneath; the fins are black, spotted with blue.

There is a similar species in the Indian seas (*Dactyl. orientalis,* Cuv., Russel 161.)

CEPHALACANTHES, *Lacép.*

Have nearly the same form, and particularly the same head, as the Dactyloptera, from which they differ by the total absence of the supernumerary fins or wings.

Only one species is known, which is very small, and belongs to Guiana, and not to India, as has been always said, (*Gasterosteus spinarella,* Lin. Mus. Ad. Fred. pl. xxxii. f. 5.)

COTTUS, *Lin.*

Have the head broad and depressed, shielded, and variously armed with spines or tubercles; two dorsal fins; there are teeth on the front of the vomer, but not on the palate; there are six rays to the gills, and three or four only to the ventral fins. The lower rays of the pectoral fins, as in the weavers (*Trachinus,* L.), are not ramified; their cœcal appendices are not numerous, and they are without an air-bladder.

The species belonging to the fresh waters have the head nearly smooth, and one spine only on the preoperculum; their first dorsal fin is very low. The most common species is

Cottus gobio, Lin., Bl. 39. i. 2.

A small fish, four or five inches long, blackish.

The salt water species are more spiny: when irritated they swell out the head. There are two on our coasts, called sea scorpion, &c.

The one,

Cottus scorpius, L.

Has three spines to the preoperculum. The other,

C. Bubalis, Euphrasen, Nov. Mem. de Stock. vii. 95.

Has four spines, the first of which is very long.

In the Baltic there is a third species, distinguished by four bony tuberosities, looking as if carious on the cranium, (*C. quadricornis*, Bl. 108.)

There are some much larger species in America and in the North Pacific Ocean[1].

This last sea produces also a small species, but whose singular forms render it worthy of remark. It is

Cottus diceraus, Pale. *Synanceia cervus*, Tiles. Mém. de l'Ac. de Pétersb. iii. 1811, p. 278.

In which the first spine of the preoperculum, almost as long as the head, has on its internal edge six or eight thorns, curved toward the base[1].

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[1] *C. Virginianus*, Will. x. 15., or *Octodecim spinosus*, Mitch., New York Trans. iv. 380. *C. polyacanthocephalus*, Pall. Zoog. Ross, &c.

There have been properly separated from the cotti, the

ASPIDOPHORI, *Lacép.*

AGONUS, *Bl. Sch.*, PHALANGISTA, *Pall.*

Which have the body shielded by angular plates, like the peristedion; the mouth has no teeth on the vomer.

On our oceanic coasts there is one,

Cot. cataphractus, Lin., Bl.

A small fish, of a few inches long, which has the mouth opening underneath, and all the membranes of the gills furnished with small fleshy filaments.

The North Pacific Ocean produces many species, among which are found some like the European species, with the mouth underneath, and the membrane of the gills villose[2].

Others have the lower jaw more forward, and the branchiostegous membrane smooth[3].

Others, moreover, have the jaws equal, and the two dorsal fins separated[4].

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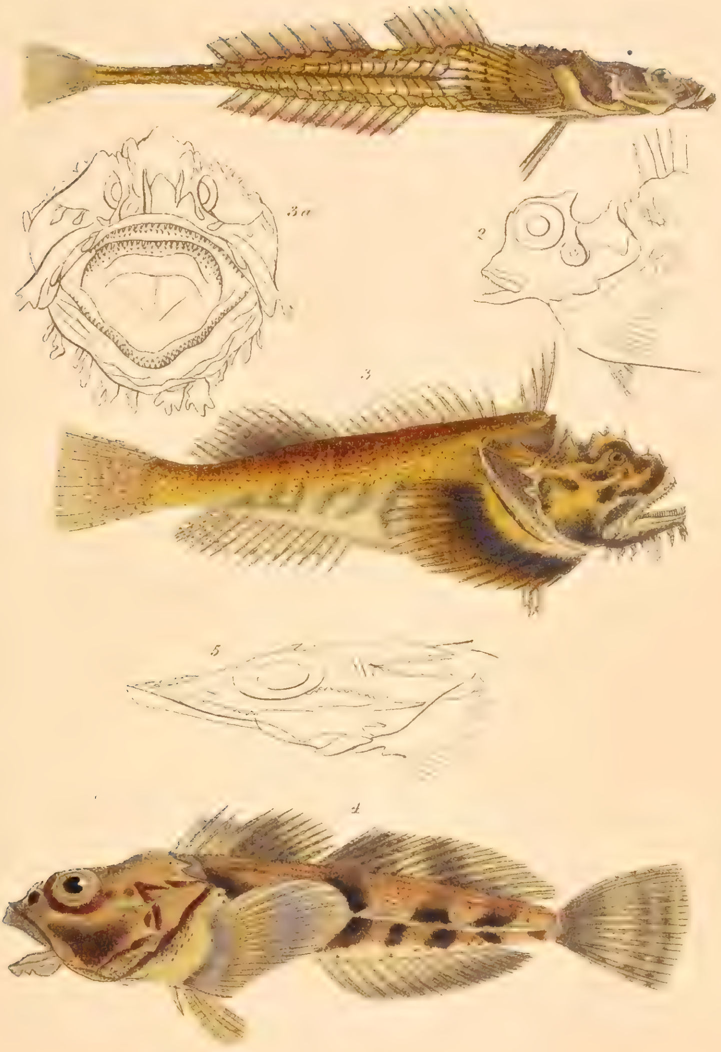
[1] *C. pistilliger*, Pall. Zoog. Ross. iii. 163. N.B. *Cottus anostomus*, Pall. Zoog. Russ. iii. 128. is an *Uranoscopus*.

[2] *Phalangistes acipenserinus*, Pall., or *Ag. acip.* Tiles.

[3] *Phal. loricatus*, Pall., or *Agonus dodecaedrus*, Tiles. *Phal. fusiformis*, Pall., or *Ag. rostratus*, Tiles. *Ag. lævigatus*, Tiles, or *Syngnathus segaliensis*, Mém. des Nat. de Moscou ii. 14.

[4] *Cottus japonicus*, Pall., Spic. Zool. vii. 5., or *Ag. stegophthal-*



1. *Aspidiphorus segaliensis*

2 *Head of Aspidiph. quadricornis.*

3 *Hemitripterus americanus.*

4 *Hemilepidotus Tilesii.*

5 *Head of Platycephalus asper.*

Finally, there is one in India with only a single dorsal fin. M. de Lacépède has made his genus ASPIDOPHOROIDE of it [1].

Latterly, other groups have been established connected partially with the cotti, and partially with the scorpænæ.

HEMITRIPTERUS, *Cuv.*,

Have the head depressed, and two dorsal fins like the cotti, and their skin is without regular scales, but there are teeth in the palate; their head is rough and spiny, furnished with many fleshy fibres; their first dorsal fin is deeply emarginated, which has led to the idea that they had three dorsal fins.

Only one is known which belongs to North America, (*Cottus tripterygius*, Bl., Schn.,) which is taken with the cod; from one to two feet long, tinted yellow and red, varied with brown [2].

HEMILEPIDOTUS, *Cuv.*,

Have the head nearly like cottus, but they have but one dorsal fin; there are teeth in the palate, and there are on the body scaly longitudinal bands, se-

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mus, Til., Mém. de Pétersb. iv. 12., and Voyage of Krusenstern, pl. lxxxvii.; *Ag. decagonus*, Bl. Schn. pl. xxvii.

[1] *Cot. monopterygius*, Bl. 178. 1. 2.

[2] It is also *Cottus acadianus*, Pen. Arct. Zool. iii. 371.; the *Cottus hispidus*, Bl. Schn. 63.; the *Scorpœna flava*, Mitchill, New York Trans. i. 2. 8.; and perhaps the *Scorpœna Americana* of Gm. Duhamel, sect. 5. pl. ii. f. 8.; but this figure must be very bad.

parated by other naked bands. A thick epidermis hides these scales, except when the skin is dry.

This genus is known only in the North Pacific Ocean[1].

PLATYCEPHALUS, *Bl.*,

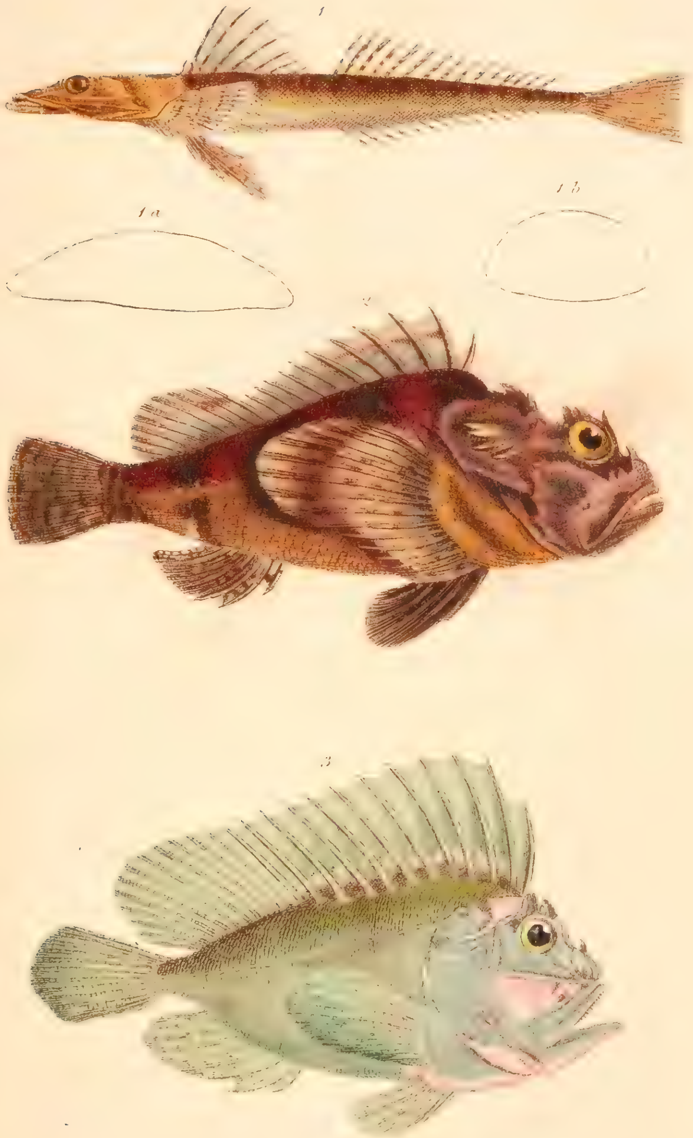
Have been separated from the cotti for reasons still more pressing: their ventral fins are large, with six rays, and placed behind the pectorals; their head is much depressed, trenchant at the edges, armed with spines, but not with tubercles; they have seven rays to the gills, and are covered with scales; their palatines have a range of sharp teeth, &c. They belong to the Indian seas, and hide themselves in the sand, watching for their prey. One of the species has been hence named *Cottus insidiator*, Lin.[2]

N. B. The genus centranodon of Lacép. is founded only on the supposed *Silurus imberbis* of Houttuyn, which is nothing but a platycephalus.

---

[1] *Cot. hemilepidotus*, Tiles. Mém. de l'Ac. de Pétersb. iii. p. 11. f. i. 1 and 2, which is probably also the *Cottus trachurus* of Pal. Zoog. Russ. iii. 138.

[2] It is also *Cottus spatula*, Bl. 424.; *Cotte madegasse*, Lacép. iii. 2. 12.; the *Callionymus Indicus*, L. Russel 46, or *Calliomore Indien*, Lacép.; *Platyc. endractensis*, Quoy and Gaym. Voy. de Freycin. p. 353; *Cot. scaber*, Lin. Bl. 189. Russel. 47.; the two species or varieties of Krusenstern, pl. lix.; the *Sandkruyper* of Renard, second part, pl. l. f. 210, and a number of new species which we will describe in the fourth vol. of our Ichthyology; but the *Plat. undecimalis*, Bl., Schn., is a centropome; his *Pl. sexatilis*, a cychhla, and his *Pl. dormitator*, an eleotris.



1 [illegible] multispines

1a Section of Body toward the Head

1b Section of Body toward the Middle

2 [illegible]

3 [illegible]

SCORPÆNA, *Lin.*,

Have, like the cotti, the head shielded and prickled, but it is laterally compressed; their body is covered with scales; there are seven rays to the gills; and their back has only a single fin. With the exception of the manner in which their cheeks are armed, and the tubercles which frequently give them a singular appearance, they approximate to certain of the percoïdes, such as the acerina and centropristis, but, as in the cotti, the inferior rays of their pectoral fins, although articulated, are simple and not branched.

SCORPÆNA, (properly so called) *Cuv.*,

Have the head spiny and tubercular, without scales; the teeth are even in the palate as well as in the jaws; cutaneous filaments appear on different parts of the body.

We have two species:

Sc. scropha, Lin. Bl. 182. and better, Duham. sect. V. pl. iv.

Redder, with the scales larger, and the cutaneous filaments more numerous.

Sc. porcus, Lin., pl. 181. Duham, sect. V. pl. iii. x. ii.

Browner, with the scales smaller and more numerous; they live in numbers in rocky places; their prickles are said to inflict dangerous wounds[1].

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[1] *Sc. Diabolus*, Cuv., Duham., sect. V. pl. iii. f. 1.; *Sc. bufo*, Cuv., Parr. 18. 1.; *Sc. cirrhosa*, or *Perca cirrhosa*, Thunb. Nouv.

The TÆNIANOTES are scorpænæ, with a compressed body, and in which the dorsal fin, which is very high, is united to the caudal.

SEBASTES, *Cuv.*,

Have all the characters of scorpæna, except that they want the cutaneous filaments, and that their head is scaly instead of prickly.

There is a large species in the North Sea, called *Marulke,* and in some places *Carp,* (*Sebastes Norvegicus,* Cuv., *Perca marina,* Pen., *Perca Norvegica,* Müll.) Bonnat. Ency. Méthod. pl. d'Ichtyol. fig. 210. Red, and frequently exceeds two feet. It is dried for eating. The dorsal spines serve the Esquimaux as needles.

The Mediterranean has one like it, but with the dorsal rays less numerous, (*Sebastes imperialis,* Cuv., *Scorpœna dactyloptera,* Laroche, Ann., Mus. XIII. pl. xxii. f. 9.) The palate is black; it is destitute of air-bladder, although the preceding species has one [1].

PTEROIS, *Cuv.*,

Have the characters of the scorpæna, properly so called,

Mém. de Stock. xiv. 1793. pl. vii. f. 2.; *Scorp. papillosa,* Forst., Bl., Schn., 196; *Sc. plumier,* Lacép. i. 19. 3.; *Sc. venosa,* Cuv. Russ. 56, and many new species described in our fourth volume.

[1] The pretended *Scorpœna malabarica,* Bl. Schn. 190, is a sebastes, the same as the Mediterranean species; *Scorp. capensis,* Gm. *Holoc. albofasciatus,* Lacep. iv. 372; *Perca variabilis,* Pall. or *Epinephelus ciliatus,* Tiles. Mém. de l'Ac. de Pétersb. iv. 1811. pl. xvi. f. 1—6.

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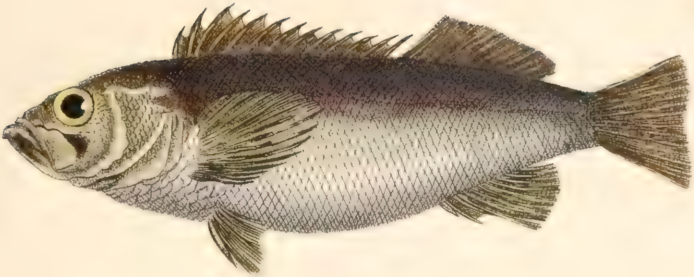

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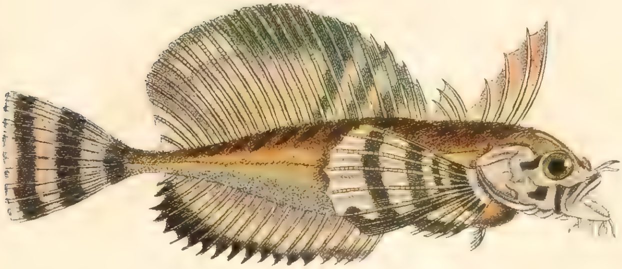

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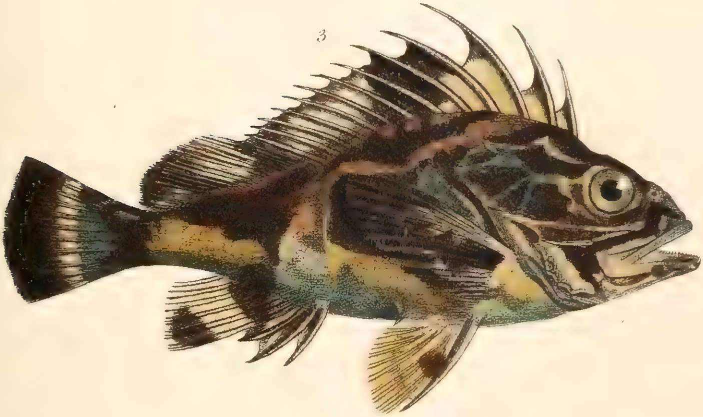

1 *Sebastes variabilis*

2 *Blepsias trilobus*

3 *Apistes marmoratus*

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except that they are without palate-teeth, and their dorsal and pectoral rays are excessively elongated.

They are Indian fish, not less remarkable for this singular elongation than for the pleasing arrangement of their colours[1].

BLEPSIAS

Have the head compressed, the cheeks shielded, fleshy barbels under the lower jaw, five rays to the gills; very small ventral fins, and one dorsal fin, which is very high, divided into three by emarginations.

Only one is known, belonging to the Aleutian Islands[2].

APISTES

Have the palate teeth and the undivided dorsal fin of scorpæna, but the rays of their pectoral fins less numerous are all branched. Their particular character consists in a strong suborbital spine, which, jutting out from the cheek, becomes a perfidious weapon, (ἄπιστος perfidus.)

They are fish of a small size. The first subdivision has the body scaly, and among them some have a free ray under a great pectoral fin[1].

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[1] *Scorpæna volitans*, Gm. Bl. 184; *Sc. antennata*, Bl. 185; *Sc. Kœnigii*, id. Nouv. Mém. de Stock. x. 7.; and many new species described in our fourth volume.

[2] *Blennius villosus*, Stel. or *Trachinus cirrhosus*, Pall. Zoog. Ross. iii. 237, No. 172. Blepsias is a name left by the ancients without characteristic designation.

Others have ordinary pectorals without the free rays[2].

Another subdivision has the body naked, and of those, too, some have the free ray under the pectoral[3]; while others are without this ray[4].

Agriopes

Are without the suborbital spine, but have the dorsal fin still higher than the apistes, and brought forward to between the eyes. Their nape is high, the muzzle narrow, the mouth small, with few teeth, and the body without scale[5].

Pelors

Have an undivided dorsal fin, and the palatine teeth

---

[1] *Ap. alatus*, Cuv. Russel, 160. B.; *Scorp. carinata*, Bl. Schn.

[2] *Cottus Australis*, J. White, New South Wales, iv. 266; *Ap. tœnianotus*, Cuv. Lacép. iv. 3. 2. This figure is entitled *Tœnianote, large raie*, but it has nothing in common with the *T. large raie* of the text, iv. 303, 304, which is a malacanthe, and the same as is represented, iii. 28. 2. under the name *Labre large raie; Perca cottoïdes*, Lin. Mus. Ad. Fred. ii. p. 84.

[3] *Ap. minous*, Cuv. Russell, 159; *Sc. monodactyle*, Bl. Schn.

[4] The species are new, and described, as well as many of the preceding subdivisions, in our fourth volume.

[5] *Blennius torvus* de Gronov. Act. Helv. vii. pl. iii. copied Walb. iii. pl. ii. f. 1. or *Coryphœna torva*, Bl. Schn. and some new species.

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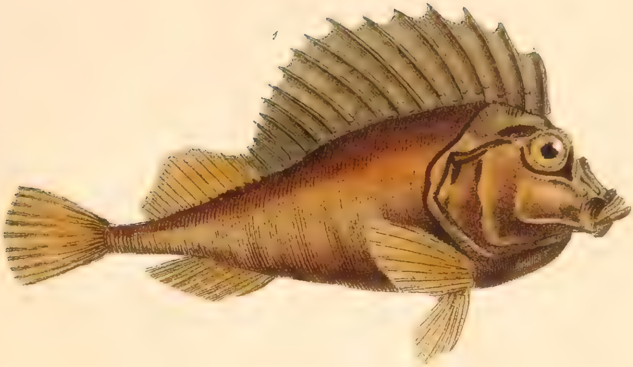

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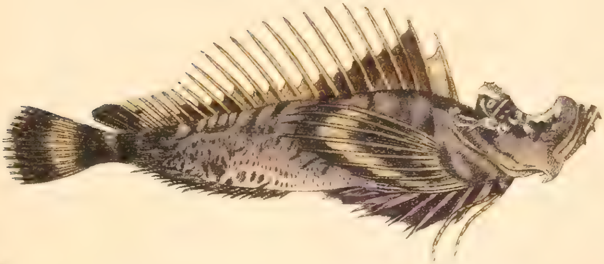

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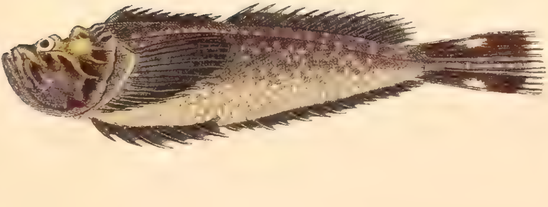

1 *Agriopus peruvianus*

2 *Pelor maculatum*

3 *Synanceya elongata*

[illegible]

of scorpæna, but the body is without scales, and there are two free rays under the pectoral fin, the head is crushed in part, the eyes near each other, the dorsal spines very high, and nearly free; they have not the suborbital spines of apistes. Their strange shape and monstrous appearance distinguish them from all other fish. They come from the Indian Seas[1].

SYNANCEIA, *Bl.*, *Schn.*,

Are not less monstrous than the last, their head is rough, tubercular, not compressed, often enveloped in a loose and fungous skin; their pectoral rays are all branched; their dorsals not divided, and they have no teeth either on the vomer or the palatine bones; their frightful ugliness has caused them to be considered venomous by the fishers of the Indian Seas where they are found[2].

LEPISACANTHES, *Lacép.* MONOCENTRIS, *Bl.*, *Schn.*,

Form a singular genus, with a short and thick body entirely covered with enormous angular shields, rough and carinated. Four or five thick spines stand in the place of the first dorsal fin, and the ventrals are composed each of an enormous spine, in the angle of which are hidden some soft rays almost imperceptible. Their head is thick and shielded; their front swollen out; the mouth rather large; the jaws and palate have close even teeth, but the vomer is without them. There are eight rays to the gills.

---

[1] *Pel. obscurum*, Cuv., or *Scorpæna didactyla*, Pal. Spic. Zool. vii. 26. 4. Sab. iii. 28. 3. or *Trigla rubicunda*, Hornstedt Mém. de Stock. ix. 3.; and some new species described in our fourth volume.

[2] *Scorpæna horrida*, Lin. Lacép. ii. 17. 2. and again, but not so good, Bl. 83; *Sc. brachion*, Lacép. iii. 12. 1. or *Synanceia verrucosa*, Bl. Schn. 45; *Syn. bicapillata*, Lacép. ii. 11. 3.

Only one species is known, proper to the Japan Seas.

Monocentris Japonica, Bl., Sch. pl. xxiv.

Six inches long, and silvery white[1].

GASTEROSTEUS[2], *Cuv.*,

Have also the cheeks shielded, although their head is neither tuberculous nor spiny, as in the preceding genera. Their particular character consists in having the dorsal spines free, and not forming a fin, and also in having the pelvis united to humeral bones larger than common, furnishing the belly with a sort of bony cuirass. Their ventral fins are placed behind the pectoral, and are reduced almost to a single spine; there are only three rays to their gills.

We have some of them which are very numerous in our fresh waters.

---

[1] *Gasterosteus Japonicus*, Houtt. Mém. de Harl. xx. second part, 299, or *Sciæna Japonica*, Thunb. Nouv. Mém. de Stock. xi. 3. copied, Bl. Schn. pl. xxiv.

[2] This name, which signifies bony belly, agrees with the Sticklebacks, (*Gasterostei*) such as we define them, and not with many fish of the scomber family, which Linnæus placed with them, because their dorsal spines are free. These we transmit to our genus LICHIA.

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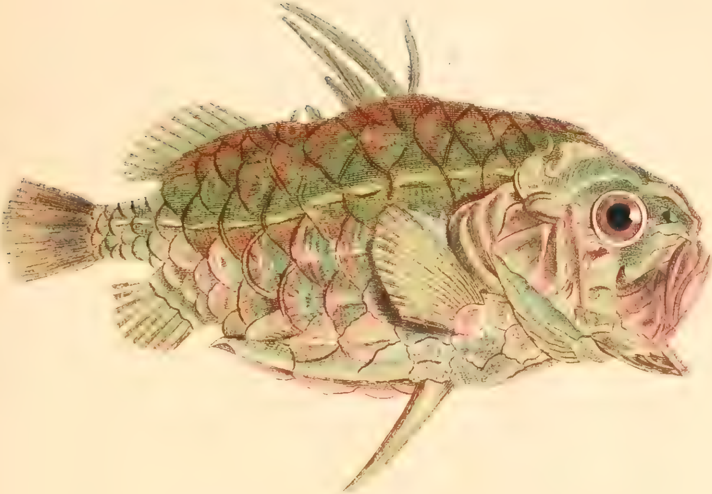

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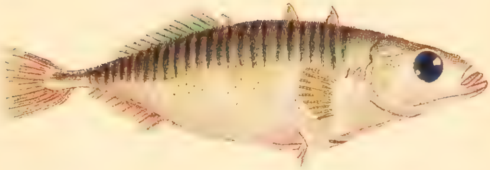

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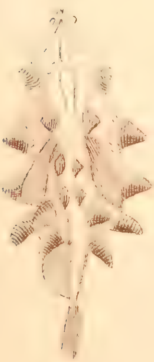

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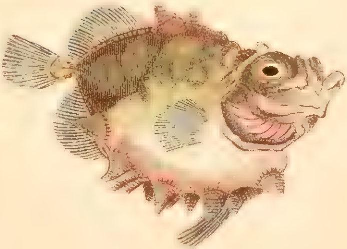

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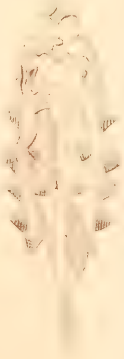

1 *Monocentris Japonica*

2 *Gasterosteus brachycentrus.*

3 *Oreosoma coniferum*

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Two species are confounded together under the name of *Gasterosteus aculeatus,* Lin., which have three free spines on the back. One of these species, *G. trachurus,* Cuv., Bl., pl. liii. f. 3. has all the sides to the end of the tail covered with scale plates. The other *G. gymnurus,* Cuv. Willughb. 341, has these plates on the pectoral region only. One or other of these appears sometimes in such prodigious numbers in certain waters in England, and in the north, that they are made use of to manure the land, feed pigs, make oil, &c.[1]

G. pungitius, Lin., Bl., 53, 54.

Is the smallest fish of our fresh water. It has nine very short spines on the back; the sides of the tail have some carinated scales; but there is also in our fresh waters a species nearly allied to this, *G. lœvis,* Cuv., which is without this armour.

We might make a separate subgenus of

Gast. spinochia, Lin., Bl., 53. 1.

The sea Gasterosteus, thin and elongated in form, with fifteen short spines on the back, and all the lateral line covered with carinated scales. The ventral buckler is divided into two, which, besides the spines, have two very small rays.

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[1] Approximating species, or Gasterostei, with three spines, are *G. argyropomus,* Cuv.; *G. brachycentrus,* Cuv.; *G. tetracanthus,* Cuv., three species from Italy; *G. noveboracensis,* Cuv.; *G. niger,* Cuv., or *biculeatus,* Mitchill, New York Trans. i. 1. 10; *G. quadracus,* id. ib. f. 11; *G. cataphractus,* Tiles. Mém. de l'Acad. de Petérsb. iii. 8. 1.

We think we may place at the end of this family

OREOSOMA, *Cuv.*

Small oval fish, with the body bristling, both above and beneath, with large cones of a horny substance, which make, as it were, hills upon them; there are four of these cones on the back, and ten on the belly, in two ranks, with many small ones between these ranks.

It has been brought from the Atlantic Ocean by Peron[1].

The third family of the acanthopterygians, that of the

SCIÆNOIDES,

Is very similar to that of the percoïdes, and presents nearly all the same combinations of exterior character, especially the denticulations of the preoperculum, and the spines of the operculum; but it has no teeth either on the vomer or palatines; in general the bones of the cranium and face are cavernous, and form a snout more or less rounded. It often occurs in this family that the vertical fins are rather scaly.

There are sciænoïdes with two dorsals, and others with but one. Among the former are reckoned the genus

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[1] A figure, and detailed description of it will be found in the fourth volume of our Ichthyology. *Oreosoma*, mountainous body.

SCIÆNA,

Of which the general characteristics are a rounded head, supported by cavernous bones, and two, or sometimes but one, dorsal, deeply emarginated, and of which the soft part is much longer than the spinous; a short anal fin; a denticulated preoperculum; an operculum terminated in points; seven rays to the gills. This tribe resembles the perch, except that the palate is unfurnished with teeth. The entire head is scaly, the natatory bladder has often remarkable appendages, and the stones of the ear are larger than in most fish [1].

We divide this genus as follows:

SCIÆNA, (proper) *Cuv.*,

Have but weak prickles at the anal fin, and neither canine teeth nor barbles.

One species is found in our seas, called

Maigre at Aunis, *Peisrey* in Languedoc, *Fegaro* by the Genoese, *Umbrina* by the Romans, &c.

SCIÆNA UMBRA, *Cuv.*

Which grows to an immense size, six feet or more.

---

[1] This description of the genus sciæna, is according to the opinion of Artedi; Linnæus and his successors have variously modified it, but we think not happily.

The natatory bladder is remarkable for its ramified appendages, which abound on either side.

It is a good fish, but become rather rare on our coasts of the ocean[1].

THE OTOLITHI. (OTOLITHUS, *Cuv.*,)

Have, like the sciæna, the bones of the anal fin weak, and want barbels; but some of their teeth terminate in elongated hooks, or are of the canine form. Their natatory bladder has on each side a horn projecting forward. The American and Indian Seas produce these fishes[2].

ANCYLODON,

Closely resemble the Otolithi, snout very short, canine teeth remarkably long, tail pointed[3].

CORVINA, *Cuv.*,

Have neither canine teeth nor barbels; all their teeth

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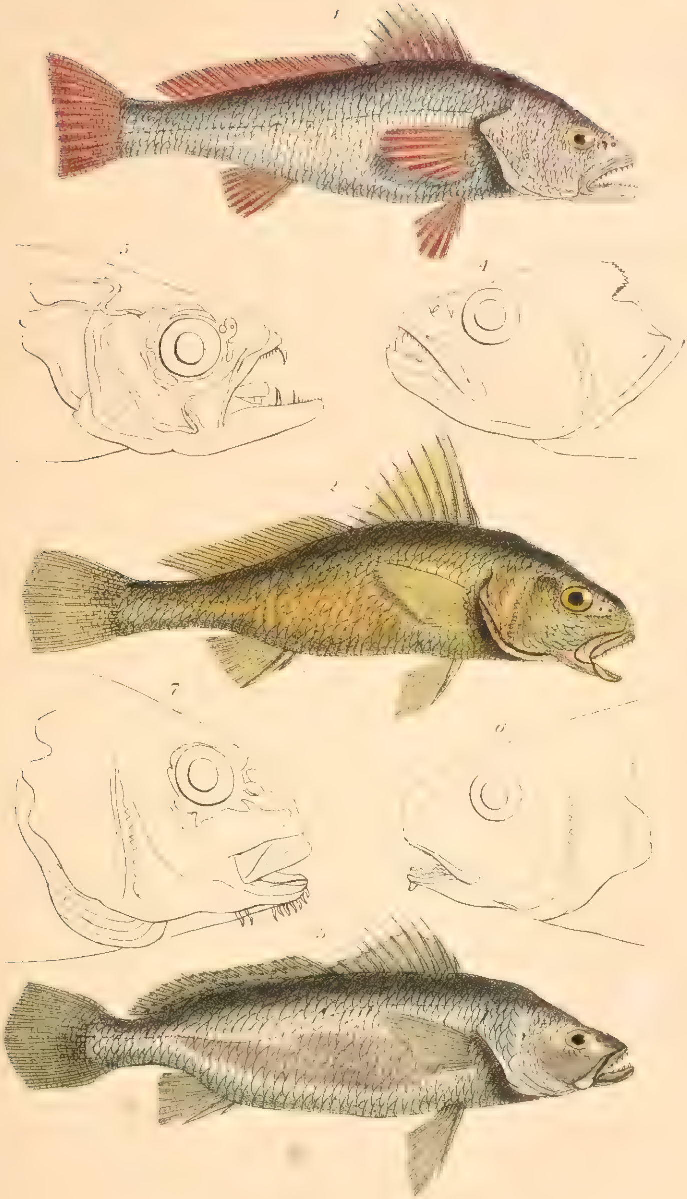
[1] Artedi having confounded it with the *Sciæna nigra*, it is only of late years that it has been reconsidered as a distinct fish. See my Memoir on the Maigre in the Mém. du Muséum, Vol. i. p. 1; add the *Maigre of the Cape*, or *Labre hololépidote*, Lacép. iii. 21. 2; *the Maigre brulé*, *perca ocellata*, Lin.; *centropomeœillé*, Lacép.; the *Sciæna imberbis* of Mitchill, and the *Lutjan triangle*, Lacép. iii. 24. 3.

[2] *Ot. ruber*, C., or the *Péche pierre* of Pondicherry; *Johnnius ruber*, Bl. Schn. pl. xvii.; *Ot. versicolor*, N., Russell, ii. 109; *Ot. regalis*, Cuv.; *Johnius regalis*, Bl., Sch., or *Labrus squeteague*, Mitchill, Trans. New York, 1. 11. 6; *Ot. rhomboïdalis*, or *Lutjan* of Cayenne, Lacép. ix. p. 245; *Ot. striatus*, Cuv., or *guatucupa*, Margr., Bras., 177, and many others described in our fifth volume.

[3] *Lonchurus ancylodon*, Bl., Schn., pl. xxv.



1 *Sciæna aquila*

2 *Corvina furcræa*

3 *Johnius senegalensis*

4 *Head of Otolithus ruber*

5 *Ancylodon parvipinnis*

6 *Umbrina cirrhosa*

7 *Pogonias fasciatus*

are even. They otherwise differ from the maigres and the otolithi by the thickness and strength of their second anal spine.

One species abounds in the Mediterranean.

The black Corvina, (Sciæna Nigra, Gm.) Bl. 297.

Of a silvery brown colour, with black ventral and anal fins[1].

JOHNIUS, *Bl.*,

Are connected with the corvinæ by an almost uninterrupted series, and have only the second anal prickle weaker, and shorter than the soft rays which follow it.

They inhabit the Indian Seas; their flesh is white and delicate, and forms an important article of food for the inhabitants[2].

They are found also at Senegal, and in America[3].

---

[1] Add *Corvina miles*, C., or *Tella katchelee*, Russel, 117; *C. trispinosa*, C., or *Bodianus stellifer*, Bl. 331. 1; *C. oscula*, Lesueur, Sc. Nat. Phil. Nov. 1822; *Bola cuja*, Buchan. Fishes of the Ganges, pl. xii. f. 27; *C. furcræa*, N., Lacep. 4. p. 424; and *Bola coiton*, Buchan. 27. 24.; *Bodianus argyrolencus*, Mitchill, Trans. New Y. 1. 6. 3.

[2] The English of Bengal have given them the name of *Whiting; John. maculatus*, Bl., or *Sarikulla*, Russ. 123; *J. cataleus*, C., Russ. 116, or *Bola chaptis*, Buchan. x. 25.; it is the *Lutjan diacanthe*, Lacép. iv. 244; *J. anei*, Bl., 357; *J. karutta*, Bl.; *J. pama*, Cuv., Buchan. xxxii. 26.

[3] *J. Senegalensis*, Cuv., a new species; *J. humeralis*, C., or *Labrus obliquus*, Mitchill, which appears also to be the *Perca undu-*

UMBRINA, *Cuv.*

Are distinguished from the other sciænæ, by a barble which they have under the symphysis of the lower jaw.

There is a fine species in the Mediterranean, *Sciæna cirrhosa*, L. Bl. 300, striped obliquely, with a steel colour on a golden ground. It is a large and good fish, and is found occasionally in the Bay of Biscay.

It has ten short cœcums, and a large air-bladder furnished with rounded lateral sinuses[1].

The LONCHURI, *Bl.*,

Appear to differ from the umbrinæ only by a pointed caudal fin, and two barbles at the symphysis[2].

POGONIAS, *Lacép.*,

Resemble the umbrinæ, but instead of one single barbel under the jaw, they have several.

America produces one (*Pogonias fascé*, Lacép. ii. xvi. (2.) of a silvery hue, which has, when young, vertical brown bands, and attains the size of our

---

lata, Lin. ; *J. Xanthurus*, or *Leiostome queue jaune*, Lacép. xiv. 10. 1; *J. saxatilis*, Bl., Schn.

[1] The *Cheilodiptère cyanoptère*, Lacép. iii. 16. 3. is nothing but an umbrina rudely drawn ; add. *Omb. Russelii.* C., Russel, cxviii.; *Sc. nebulosa*, Mitchill, iii. 5. which is also the *perca alburnus*, L., Catesb. xii. 2.; *Kingfisch*, or *Whiting* of the Anglo-Americans; the *Pogonathe doré*, Lacép. v. 12. 2. belongs also to this subgenus.

[2] *Lonchurus barbatus*, Bl. 359.

sciæna, and has, like it, ramified appendages to its natatory bladder [1].

This fish emits a sound still more remarkable than that of the other sciænoïdes, and which has been compared to the noise of several drums. Its pharyngeal bones are furnished with large flat teeth [2].

The genus

EQUES, *Bl.*

Is not far removed from the sciænoïdes with two dorsals. It is known by a compressed body, long, high on the shoulders, and terminating in a point towards the tail; their teeth are even; their first dorsal is high, the second long and scaly: they are all of America [3].

The sciænoïdes with a single dorsal are subdivided according to the number of their branchial rays.

Those that have seven, form several genera, corresponding with many genera of the percoïdes; their preoperculum is always denticulated.

---

[1] It is the *Labrus grunniens*, Mitch. iii. 3; the *Sciæna fusca*, and *gigas* of the same author, appear to be some of a more advanced age, and every thing shows that it is also the *Labrus chromis* of Linnæus; lastly, the *Pogonathe courbine*, Lacép. v. 121, does not differ from it; Add. *Ombrina Fournieri*, Desmar., Dict. class. d'Hist. Nat.; its barbles are almost imperceptible.

[2] They are represented by Antoine de Jussieu, *Mém. de l'Ac. des Sc.* for 1723. pl. xi.

[3] *Eques balteatus*, C., or *Eq. Americanus*, Bl. 347. 1., or *Chætodon lanceolatus*, Lin., Edw. 210. *Eq. punctatus*, Bl. Schn. iii. 2. *Eq. acuminatus*, C., *Grammistes acuminatus*, Bl. Schn., Seb. III. xxvii. 33.

Hæmulon, *Cuv.*

Commonly called red gullet in the Antilles, have rather a lengthened profile, which has been thought to have some resemblance to that of the pig; the lower jaw is compressed, and opens wide, having under its symphysis two pores, and a little oval dimple: their teeth are even; those parts of the lower jaw, which are drawn in when the mouth shuts, are generally of a bright red, from which they derive their name[1]. Their dorsal is a little emarginated; the soft part of it is scaly. They all come from America[2].

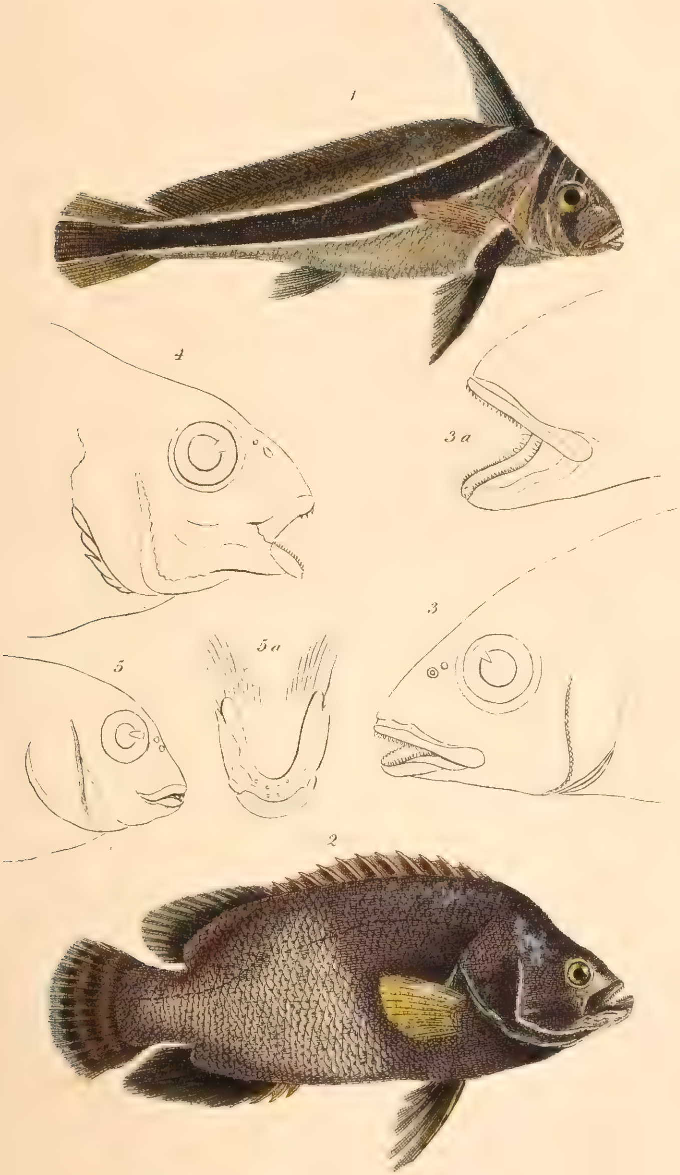
Pristipoma, *Cuv.*

Have the same preoperculum, the same pores under

---

[1] From *αἷμα*, *blood*, and *οὖλον*, *gums*.

[2] *Hæm. elegans*, C., or *Anthias formosus*, Bl. 323. *Hæm. formosum*, C., or *Perca formosa*, Lin., which is not the same as the preceding one, Catesb. II. vi. 1.; but it is the *Labre plumiérien*, Lacép. III. ii. 2., and the *Guaibi coara* of Margr. p. 163., of which the drawing is transposed, and placed under the article of the *Capenna*, p. 155. *Hæm. heterodon*, or striped *diabase*, Desmar., Dict. class. d'Hist. Nat. *Hæm. caudimacula*, C., or *uribaco*, Margr. 177.; and *Diabase* of Parra, Desm. loc. cit. *Hæm. capeuna*, or *Capenna*, Margr. 155., and the fig. p. 163. at the article of the *Guaibi coara*. It is the *Grammist. trivittatus*, Bl. Schn. 188; *Hæm. chrysopterum*, Cuv., or *Perca chrysoptera*, L., Catesb. II. ii. 1., and many other species described in our fifth volume.



1 *Eques balteatus*
2 *Lobotes erate*
3 *Head of Hæmulon heterodon*
4 *Pristipoma bilineatum*
5 *Diagramma orientale*

London, Publish'd by Whittaker & C°. Ave Maria Lane, 1839

the symphysis as the hæmulons; but their snout is thicker, their mouth smaller, their dorsal and anal have no scales; their operculum terminates in a blunt angle, hidden in its membranous edge.

It is a very numerous genus, of which the species are found in the warmest parts of the two oceans[1].

DIAGRAMMA, *Cuv.*

Have no fosset under the symphysis, but they have the two small anterior pores, and besides them two larger ones, under each branch. Otherwise, their jaws, their opercula, their fins, are like those of the pristipoma.

They inhabit either ocean; those of the Atlantic have larger scales[2]; those of the Indian Ocean are more numerous, have smaller scales, the head more convex, and the snout very short[3].

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[1] *Pr. hasta*, C. *Lutjanus hasta*, Bl. 246. 1. *Pr. nageb.* C.; *Sciæna nageb.* Forsk., or *Labre comersonien*, Lacép. III. xxiii. 1.; and *Lutjan microstome*, ib. xxxiv. 2. *Pr. guoraca*, C., Russell 132., or *Perca grunniens*, Forsk., or *Anthias grunniens*, Bl. Schn. p. 305. *Pr. paikelli*, C., Russell 121. *Pr. caripa*, id. 124., of which *Anthias maculatus*, Bl. 326. 2. appears to be a variety. *Pr. coro*, C., Seb. III. xxvii. 14., or *Sciæna coro*, Bl. 307. 2. *Lutj. Surinamensis*, Bl. 253. *Sparus virginicus*, Lin., of which *Perca juba*, Bl. 308. 2. and *Sparus vittatus*, Bl. 263. are young ones. *Coius nandus*, Buchan. xxx. 32.

[2] We know but one, of which the *Lutjanus luteus*, Bl. 247. appears to be an incorrect representation.

[3] It is to them that the PLECTORYNQUE is referred, Lacép. I. xiii. 2. Add *Sciæna gaterina*, Forsk. *Sc. shotaf*, id. *Diagr. lineatum*,

The sciænoïdes with one dorsal, and less than seven rays to the gills, are again subdivided: in some the lateral line continues to the caudal fin; in others it is interrupted.

Among the former we place the following genera:

LOBOTES, *Cuv.*

Of which the snout is short, the lower jaw turned up in front, the body elevated, and of which the dorsal and anal lengthen their posterior angle; so that with their rounded caudal, their body seems to terminate in three lobes. They have four clusters of very small spots towards the end of their jaw. They are to be found in either ocean[1].

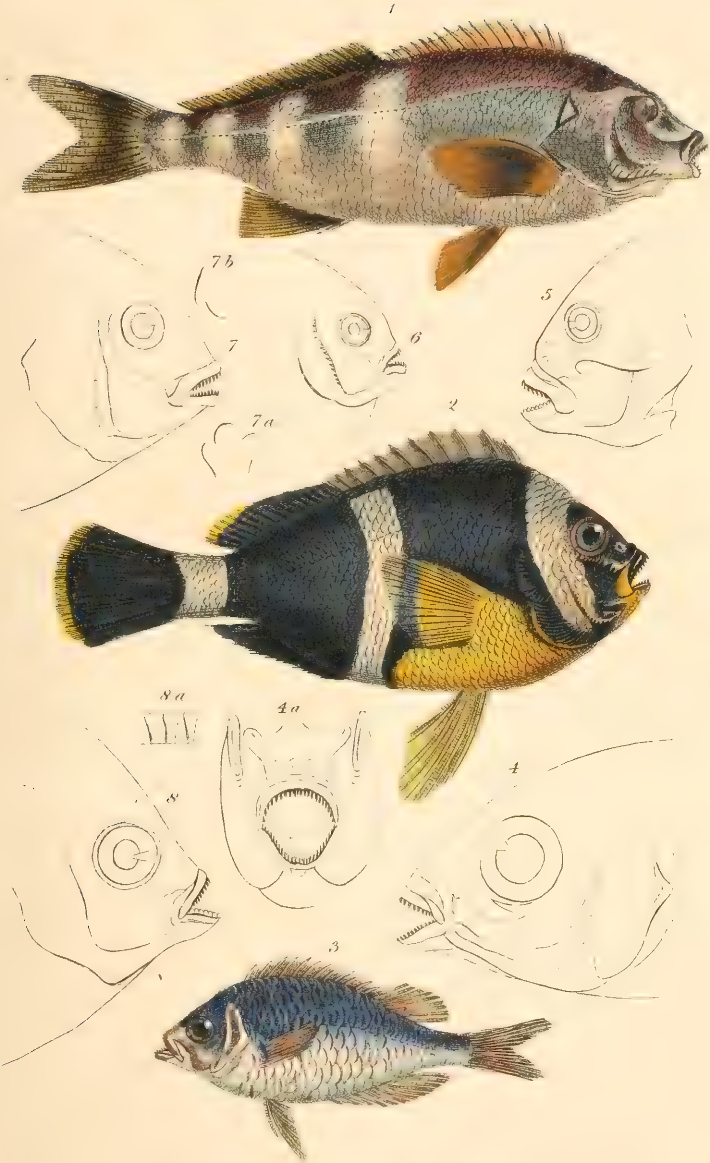
CHEILODACTYLUS, *Lacép.*

Have the body oblong, mouth small, numerous spinous rays at the dorsal, and particularly the under rays of the breast simple and extended beyond the membrane, as in the cirrhiti[2].

Cuv., or *Perca diagramma*, Lin., Seb. III. xxvii. 18., or *Anthias diagramma*, Bl. 320. *Diag. pœcilopterum*, C., Seb. III. xxvii. 17. *D. pictum*, C., Seb. III. xxvi. 32., or *Perca picta*, Thunb., nouv. Mém. de Stokh. XIII. v. *Diag. pertusum*, or *Perca pertusa*, id., ib. XIV. vii. 1.

[1] *Holocentrus Surinamensis*, Bl. 243., or *Bodianus triurus*, Mitchill III. f. 10. and some new species.

[2] The *Cheilod. fascé*, Lacép. v. 1. 1., or *Cynœdus*, Gronov. Zoophyl. i. 10. 1.; the *Cheil. of Carmichael*, or *Chætodon monodactylus*, Carmich. Trans. Lin. xii. 24. *Cheil. carponemus*, C., or *Cichla macroptera*, Bl. Schn. 342. *Cheil. zonatus*, Cuv., or *Labrus japonicus*, Tiles, Voy. of Krusenstern, pl. lxiii. f. 1.



1 *Cheilodactylus Antonii*
2 *Amphiprion chrysogaster.*
3 *Heliases frenatus*
4 *Head of Scolopsides lycogenis*

5 *Head of Premnas semicinctus.*
6 *Head of Dascyllus marginatus.*
7 *Head of Pomacentrus fasciatus*
8 *Head of Glyphisodon coelestinus*

L[illegible] published by Whittaker [illegible] Ave Maria Lane 18[illegible]

SCOLOPSIDES, *Cuv.*

Have the second suborbital bone denticulated, and terminated near the edge of the orbit by a point turned backwards, and which is crossed with a point of the third suborbital turned contrarywise. Their body is oblong, mouth narrow, teeth even, scales tolerably large, jaws not porous. They inhabit the Indian seas [1].

MICROPTERUS, *Lacép.*

Have an oblong body, three pores on each side of the symphysis, and the latter rays of the soft part of their dorsal separated from the others, and forming a small separate fin. The operculum is not denticulated [2].

The sciænoïdes with fewer than seven branchial rays, and with the lateral line interrupted, form several genera of small oval fishes, most of them beautifully variegated: they may be distinguished as follows, according to the armature of the head. They are evidently allied to the chætodons, and resemble outwardly many of our fishes with labyrinthian gills.

---

[1] *Scol. kate*, Cuv., called by Bloch *Anthias japonicus*, 325. f. 2. *Anth. Vosmeri*, Bl. 321., plate very incorrect, and the same as *Perca aurata*, Mungo Park, Trans., Lin. iii. 35. *Anth. bilineatus*, Bl. 325. 1. *Scol. kurita*, Cuv., Russell 106. *Scol. lycogenis*, Cuv., or *Holocentre cilié*, Lacép. iv. 371. *Sciæna ghanam*, Forsk., and many new specii.

[2] Only one is known, the *Microptére Dolomieu*, Lacép. iv. 3. 3. There are a few small genera of this subdivision, that we shall explain better in our fifth volume.

AMPHIPRION, *Bl., Schn.*

The preoperculum and the three opercular pieces denticulated, the latter even furrowed; a single range of obtuse teeth. I greatly reduce the number of species of this genus as composed by Bloch, type *Amph. ephipium*, Bloch[1].

PREMNAS, *Cuv.*[2]

One or two stout spines on the infra orbital, and the preoperculum denticulated.

POMACENTRUS, *Lacép.*[3]

Preoperculum denticulated, operculum unarmed; a single range of trenchant teeth[4].

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[1] *Amph. ephippium*, Bl. 250. 2; *Am. bifasciatus*, Bl. 316. 2; *Am. polymnus*, Bl. 316. 1; *Am. percula*, Cuv., or *Lutj. perchot*, Lacép. iv. 239. Klein. Mis. IV. xi. 8; *Am. leucurus*, Cuv. Renard. vi. 49, and several new species.

[2] *Chætodon biaculeatus*, Bl. 219. 2. which is also *Holocentre sonnerat*, Lacép. iv. 391; and *Lutjanus trifasciatus*, Bl. Schn. 567, and. Kœhbreuter, Petersburgh Trans. X. viii. 6. Seba III. xxvi. 29. is a variety of it; *Pr. unicolor*, Cuv. Seb. III. xxvi. 19, which is also *La Scorpène aiguillonnée*, Lacép. iii. 268.

[3] We define them differently from Lacépède, and greatly diminish their number by divisions.

[4] *Chætodon pavo*, Bl. 198. 1., which is the *Pomacentre paon*, Lacép., and his *Holoc. diacanthe*, iv. 338. *Pomacentrus*, Quoy and Gaym., Voy. Freycin., pl. lxiv. f. 2. *P. punctatus*, ib. 1. *P. emarginatus*, Seb. III. xxvi. 26, 27, 28. The *Hol. negrillon*, Lacép. iv. 367.

DASCYLLUS, *Cuv.*

The fishes of this genus only differ from those of the preceding one in their teeth, which are very short and crowded[1]. They all inhabit the Indian Ocean.

GLYPHISODON, *Lacép.*

Operculum and preoperculum smooth; a single range of trenchant, and generally notched teeth.

They are found in the Atlantic[2], but the Indian Ocean produces many more[3].

Some of them are distinguished from the others by numerous spines in the anal[4].

HELIASUS.

The opercular pieces of the glyphisodon, and teeth similar to those of the dascylli, that is, small and crowded. There are some of them in both oceans[5].

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[1] *Chætodon aruanus*, L., Mus. Ad. Fred. xxxii. Bl. pl. cxcviii. f. 2.

[2] The *Jacaraqua*, Marcgr., or *Chætod. saxatilis*, L., Mus. Ad. Fred. xxvii. 3., which is also the *Chæt. marginatus*, Bl. 207.; and his *Ch. mauritii*, 213. 1.; and the *Ch. sargoïde*, Lac.: but it is not the *Ch. saxatilis*, Bl. 206. 2.; *Ch. curassao*, Bl. 212.

[3] *Chætod. bengalensis*, Bl. 213. 2., or *Labre macrogastère*, Lacép. III. xix. 3. *Gl. melanurus*, Cuv., or *Labre six-bandes*, Lacép. III. xix. 2. *Chæt. sordidus*, Forsk., or *Calamoia pota*, Russell 85. *Gl. sparoïdes*, Cuv., Lacép. IV. ii. 1. *Gl. lachrymatus*, Cuv., Quoy and Gaym., Freycin. pl. lxii. f. 7. *Gl. azureus*, ib. pl. lxiv. f. 3. *Gl. uniocellatus*, ib. f. 4.

[4] *Chætod. suratensis*, Bl. 217. *Chætod. maculatus*, Bl. 427.

[5] The species are new; we describe them in our fifth volume.

The acanthopterygii of the fourth family, or the

SPAROIDES,

Have, like the sciænoïdes, the palate destitute of teeth; their general forms, and several details of their organization are the same; they are also covered with scales more or less large, but they have none to the fins. Their muzzle is not gibbous, nor the bones of their head cavernous. There are neither denticulations to their preoperculum, nor spines on their operculum; their pylorus is furnished with cœcal appendages. They have never more than six rays to the gills. They are divided according to the form of their teeth.

In the first tribe, that of SPARUS, *Cuv.*, the sides of the jaws are paved with round molars; we subdivide it into five genera.

SARGUS, *Cuv.*

Trenchant incisors in front of the jaws, almost similar to those of man.

Several of them, which differ but little from each other, inhabit the Mediterranean, and are even found in the Bay of Biscay. They are marked with vertical black bands upon a silver ground[1].

---

[1] *Le Sargue de Rondelet (Sargus raucus*, Geoff.), Eg. Poiss., pl. xviii. 1., Rondelet 122. *Sp. pantazzo*, of Risso. *Sargus vulgarus*, G. Eg. xviii. 2. *Salviani*, fol. 179. Fish 64. *Sargus annularis*, L., Rondel. 118., Salv. 63.; Laroche, Ann. Mus. xiii. pl. xxiv. f. 13. *Sp. ovis*, Mitch., or sheephead of the Anglo Americans.

Some have emarginated incisors[1].

The round molars of others are on a single line, and very small. From the Mediterranean[2].

CHRYSOPHRIS, *Cuv.*

Round molars on the sides of the jaw forming at least three rows on the upper one; a few conical or blunt teeth in front.

Two species occur in our seas.

Chr. auratus. Sparus aurata, L., Bloch, 266.[3] and much better, Duham. Sect. iv. pl. ii. Four rows of molar teeth above, five below; one of which is oval, and much larger than the others. A large fish, called *Chrysophris* (golden eyebrow) by the ancients, on account of a crescent-shaped band of a golden hue, which extends from one eye to the other.

Chr. microdon, Cuv. Colours nearly the same as in the aurata; smaller; the forehead more gibbous. Only two rows of molars below, all of which are as broad as they are long, or broader. The large oval one is wanting[4].

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[1] *Perca unimaculata*, Bl. 308. 1., or *Salema*, Marcgr. 153. *Sparus crenidens*, Forsk., probably belongs to this subdivision.

[2] *S. puntazzo*, Gm., or *Sp. acutirostris*, La Roche, Ann. Mus. XIII. xxiv. 12., of which Risso forms his genus CHARAX.

[3] The teeth belong to another species, and those of the true *Chr. aurata* are figured pl. lxxiv., as appertaining to the anarrhichas.

[4] Add *Sparus bufonites*, Lacép. IV. xxvi. 2., the same as his *Sp. perroquet*, ib. 3., and probably *Sp. haffara*, Forsk. 33. *Sp. sarba*, Forsk. 22. *Chr. chrysargyra*, Cuv., *Chitchillée*, Russell 91. *Sp.*

PAGRUS.

Differs from chrysophris in having but two rows of small rounded molar teeth in each jaw; the front teeth either resemble those of a card, or are small, close, and even.

Pagr. vulgaris, Sparus pagrus, L. and Artedi. Silvery with a reddish gloss; no black spot[1].

The Indian Ocean and the coast of the United States produce some of these fishes, whose first dorsal spines are prolonged into filaments[2].

Others, taken at the Antilles, are remarkable for the first interspinal of their anal fin, which is hollow, and terminates in a bill like a pen. The point of the natatory bladder runs into this kind of funnel. They are called *Sardes à plumes*[3].

A more remarkable peculiarity is that of a Cape Pagrus, whose maxillaries are enlarged, and as solid as stone; we call it *Pagrus lithognathus.*

PAGELUS, *Cuv.*

Teeth very like those of the preceding genus; but

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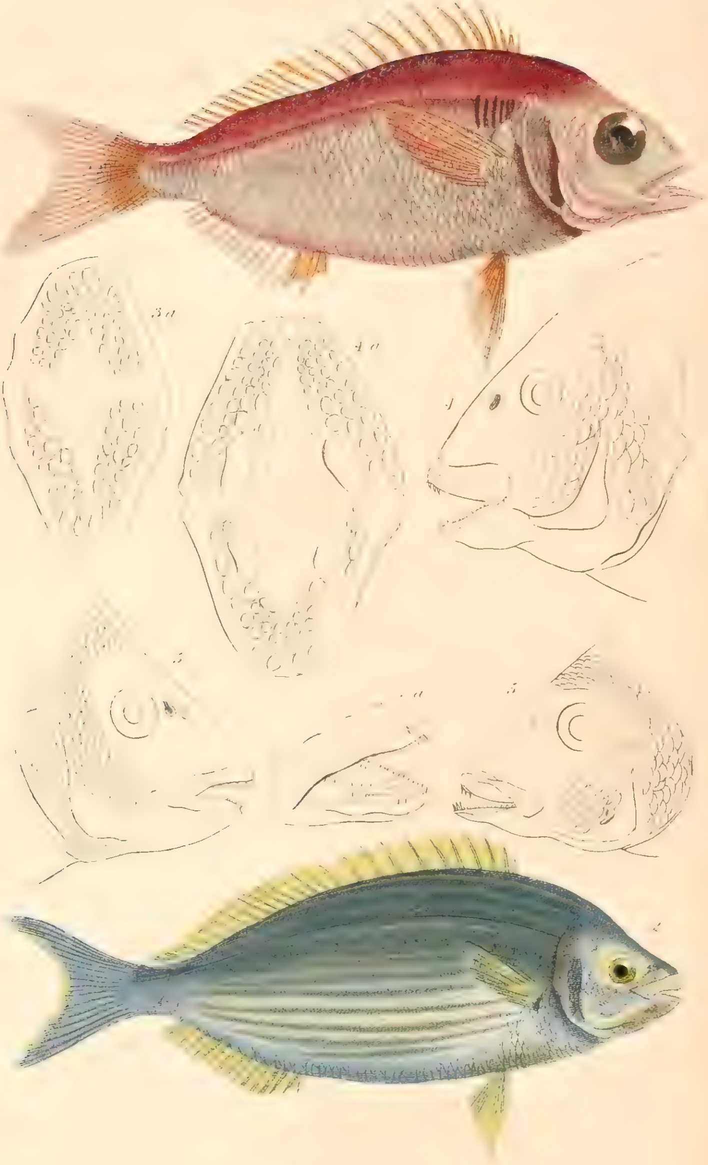
hasta, Bl. Schn. 275., or *Sp. berda*, Forsk. 33. *Sp. calamara*, Cuv., Russell 92. *Sciæna grandoculis*, Forsk. 53. *Chætodon bifasciatus*, Forsk., which is also *Le Labre chapelet*, Lacép. iii. 3., his *Sparus mylio*, ib. xxvi. 2., and his *Holocentre rabagi*, iv. Suppl. 725, &c.

[1] This is also *Sp. pagrus* of Brünnich, but not of Bloch; the latter writer has not figured the true pagrus, and in his posthumous "System" it is made *Sparus argenteus.*

[2] *Sparus spinifer*, Forsk. *Sp. argyrops*, L., or *Labrus versicolor*, Mitch.

[3] *Pagr. calamus* and *Pagr. penna*, Cuv.



1 *Pagellus centrodontus.*

2 *Boops salpa*

3 *Head & Teeth of Sargus Rondeletii*

4 *Chrysophrys aurata*

5 *Pagellus erythrinus*

the molars, also in two rows, are smaller; the front conical ones are slender, and more numerous. A more elongated muzzle gives a very different physiognomy to this genus. Several species are found in the European seas.

Pagr. erythrinus, Sparus erythrinus, L., Bl. 274. A fine fish, of a silver colour, with a clear rosy gloss; body high and compressed.

Pagr. centrodontus, Sp. centrodont., Laroche; the *Rousseau* at Marseilles; *Besugo* of the Spaniards, Ann. Mus. XIII. xxiii. 2. Silvery, glossed with rose, a large irregular black spot upon the shoulder[1].

Pagr. acarne, Cuv., the *acarne*, Rondel, 511., *Sparus berda* of Risso, but not of Forskal. Smaller, and more oblong; silvery, tinged with greenish towards the back; no black spot.

Pagr. bogaraveo, Sp. bogar. Gm., Rondel. 137. More oblong; muzzle more pointed; gilt, tinged with violet; a black spot on the axilla.

Pagr. mormyrus, Sp. mormyrus, L., Rondel. 153.; Geoff. Eg. Poiss. pl. xviii. 3. Vertical, black bands upon a silver ground.

In the second tribe there is but one genus.

DENTEX, *Cuv.*

Characterized by conical teeth, even on the sides of the jaws, generally in one range, some of the anterior of which are prolonged into large hooks. They would be rather closely allied to the genus hæmulon were it not that the denticulation of the preoperculum is wanting, and that they have one ray less to their branchiæ. The cheek is scaly. Two species are found in the Mediterranean.

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[1] It is the *Sparus pagrus*, Bl. pl. cclxii.

D. vulgaris, Sparus dentex, L., *Dentale* of the Italians; Bl. 268. Silvery, shaded with bluish towards the back. Sometimes three feet in length[1].

D. macropthalmus, Sp. macroph, Bl. Red, with very large eyes; much rarer than the preceding, and about half its size.

We distinguish from the other species of dentex, by the name of PENTAPODA, those whose mouth is less cleft, head more scaly, body less elevated, and whose caudal is covered with scales to the end[2].

By that of LETHRINUS we distinguish such as have no scales upon the cheek; most of them, as in hæmulon, have some red about the angle of the jaws[3].

All these fishes have a pointed scale between the ventrals, and one above each of them.

A third tribe is also composed of a single genus.

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[1] Add *D. macrocephalus,* Cuv., or *Labre macrocephale,* Lacép. III. xxvi. 1. *Sparus cynodon,* Bl. 278. *Dentex hexodon,* Quoy and Gaym., Voy. Freycin. 301.

[2] *Sparus vittatus,* Bl. 275. *Sp. rayé d'or,* Lacép. iv. 131., and some new species.

[3] *Spar. chærorhynchus,* Bl. Schn. 278. *Bodïan lutjan,* Lacép. iv. 294. *Kurwa,* Russell. 89. *Sciæna mahsena,* Forsk. p. 52, No. 62. *Sciæna harak,* id.

CANTHARUS, *Cuv.*

Teeth short and crowded, or bent and crowded, all round the jaws; those of the external row being the strongest. Body elevated and thick; muzzle short; jaws not protractile. Two species are found in the Atlantic and Mediterranean.

Canth. vulgaris, Spar. canth., L., Rond. 120. and Duham. sect. iv. pl. iv. fi. 1. Silver grey, longitudinally striped with brown; some small rough teeth behind the bent ones.

Canth. brama, Sparus brama, L. About the same colour; all the teeth bent [1].

In a fourth tribe the teeth are trenchant. It comprises two genera.

BOOPS, *Cuv.*

Teeth of the external row trenchant, mouth small, and nowise protractile. Several species are found in the Mediterranean.

B. vulgaris, Sparus boops, L., Rond. 136. Twenty-four teeth in each jaw, with an oblique cutting edge; the body oblong, with longitudinal gold-coloured stripes upon a silvery ground.

B. Salpa, Sparus Salpa, L., Bl. 265. More oval; stripes of a more brilliant gold, on a ground of burnished steel; teeth broad, and emarginated.

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[1] The figures given by Bloch, 269. and 270. of these two species, do not give a good idea of these fishes.

OBLADA, *Cuv.*

Differs from boops in having small crowded teeth behind the incisors, which somewhat approximates this genus to cantharus.

The Mediterranean produces one, the

Ob. communis, Sparus melanurus, L., Salv. 181. Silvery, striped with blackish; a broad black spot on each side of the tail.

We may form a fifth family of ACANTHOPTERYGII, of the

MENIDES.

Which differ from the preceding families in the extreme extensibility and retractibility of the upper jaw, which is owing to the length of the intermaxillary pedicles, which withdraw between the orbits. Their body is scaly, as in sparus, in which genus they have hitherto been placed.

MÆNA, *Cuv.*,

Distinguished from a true sparus by having very short, small, and crowded teeth, in a narrow and longitudinal band upon the vomer. Those also in the jaws are all extremely fine, forming a very narrow band. The body is oblong, compressed, and somewhat similar to that of a herring; an elongated scale above each of the ventrals, and another between them. Several species inhabit the Mediterranean.

M. vulgaris Sparus mœna, L., Bl. 270. Back lead colour, belly silvery; a black spot on the flank opposite the last spine of the dorsal.

M. jusculum, Cuv., only differs from the vulgaris in having a narrower body, a shorter muzzle, and a higher dorsal.

M. radiata, Sparus radiatus, Osbeck, *Sp. tricuspidatus,* Spinola, Ann. Mus. X. pl. xviii. A deep steel blue, oblique blue streaks upon the cheek, blue spots on the ventrals; the dorsal still higher.

SMARIS, *Cuv.*

The fishes of this genus only differ from the mænæ in the total deficiency of teeth in the vomer; their body is generally somewhat less elevated. Some of them are found in the Mediterranean.

S. vulgarus, Sparus smaris, L., *Le Picarel commun,* Laroche, Ann. Mus. XIII. pl. xxv. f. 17. Lead-grey above, silvery beneath, a black spot upon the flank.

S. alcedo, Riss. So called from the beautiful blue with which its body is variegated.

S. cagarella, Cuv. The body is as high as that of the *mæna vulgaris,* from which it only differs in having no palatine teeth.

CÆSIO, *Lacép.*,

Only differs from smaris in a dorsal somewhat higher in front, and surrounded at its base with fine scales.

They inhabit the Indian Ocean, and are shaped like a spindle[1].

[illegible]

GERRUS, *Cuv.* *Mocharra,* in South America.

The mouth protractile, but when advancing, it descends; the body is elevated, the anterior part of the dorsal in particular, along the base of whose posterior portion is a scaly sheath. They have no other teeth than those in the jaws, which are small and crowded. The first interspinal of their anal fin is hollowed like a tunnel, as in certain pagri. They are excellent food, and inhabit the hot parts of both oceans[2].

G. rhombeus, Cuv., Sloane II. pl. ccliii. f. 1. This

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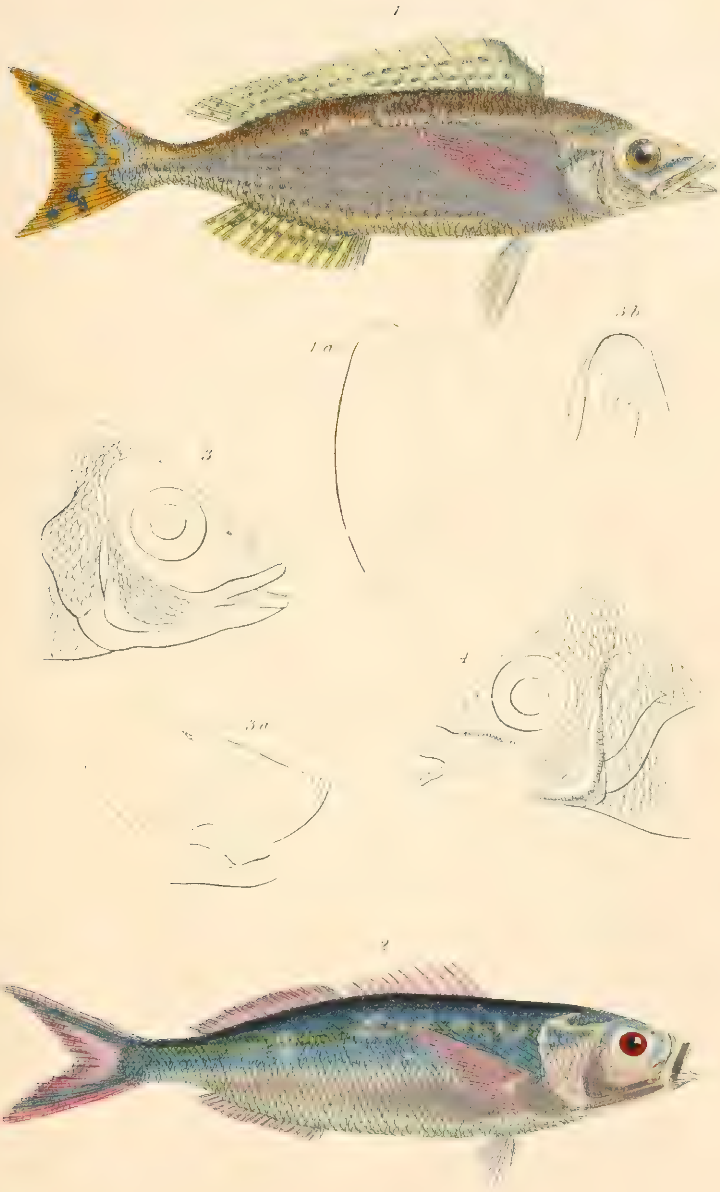
[1] *Cæsio asuror,* Lacép. iii. 86., or *Vackum,* Valent. 132., or *Canthère douteux,* Dict. Class. d'Hist. Nat. vol. iv. *C. smaris,* Cuv., or *Vackum mare,* Renard i. pl. xxxii. f. 174. *Bodianus argenteus,* Bl. 231., or *Picarel raillard,* Quoy and Gaym., Zool. Freycin. pl. xliv. f. 3. *Sparus cuning,* Bl. 263., or *Cychla cuning,* Bl. Schn. p. 336.

N.B. Lacépéde also makes a Cæsio of the *Scomber equula* of Forsk., or *Centrogaster equula* of Gm., which is our *Equula caballa.*

[2] *Labrus oyena,* Forsk., Rupp. Voy. Poiss. pl. III. x. 2., or *Spare breton,* Lacép. iv. 134., or *Labre long museau,* id. III. xix. 1. and p. 467. *Gerres aprion,* Cuv., Catesb. II. xi. 2. *G. rhombeus,* Cuv., or *Stone-bass,* Sloane, Jam. ii. pl. ccliii. f. 1. *G. poieti,* Cuv., Ren. pl. ii. f. 9., Valent. No. [illegible]. *G. lineatus,* Cuv., or *Smaris lineatus,* Humb., Zool. Obs. pl. xlvi. f. 2. *Gerres argyreus,* Cuv., or *Sciæna argyrea,* Forster, or *Cychla argyrea,* Bl. Schn. *G. filamentosus,* Cuv., or *Wordawahah,* Russ. f. 68.


1
1 a
3 b
3
4
3 a
2

1 *Smaris alcedo*

2 *Caesio tile*

3 *Maena vomeriana*

4 *Gerres Plumieri*

[illegible]

species, the *stone-bass* of Jamaica, is said occasionally to penetrate as far as the coast of Cornwall, following pieces of wood covered with anatifæ, carried there by the currents[1].

The sixth family of ACANTHOPTERYGII, or that of

SQUAMIPENNES,

Is thus named, because the soft, and frequently the spinous parts of their dorsal and anal fins are covered with scales, which encrust them, as it were, and render it difficult to distinguish them from the mass of the body. This is the most obvious character of these fishes, the body of which is generally much compressed, the intestines long, and the cœca numerous. They were comprized by Linnæus in the genus

CHÆTODON, *Lin.*

So named from their teeth, which in length and tenuity, resemble hairs collected in several close rows like a brush. Their mouth is small; their dorsal and anal fins are so completely covered with scales that it is extremely difficult to ascertain where they commence. These fishes are very abundant in the seas of hot climates, and are adorned with the most beautiful colours, circumstances which have caused many to be figured, and rendered them common in our cabinets. Their intestines are long and ample, and their cœca long, slender, and numerous; their natatory bladder is large, and very strong. They frequent rocky shores, and are eaten.

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[1] Couch, Lin. Trans. xiv. part i. p. 81.

CHÆTODON, (properly so called.)

The body more or less elliptical; the spinous and soft rays continuing in an uniform curve; the snout projecting more or less, and sometimes a very fine denticulation on the preoperculum. They have a mutual resemblance, even in the distribution of colours, most of them, for instance, being marked with a vertical black band, in which is placed the eye.

In some there are several other vertical bands parallel to the former[1].

In others they are oblique or longitudinal[2].

The flanks of some are sprinkled with brown spots[3].

Others again are merely marked with lines of reflexions in various directions; here it is merely the ocular band[4], and there are, in addition, ribands on the vertical fins[5].

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[1] *Chæt. striatus*, L., Bl. 205. f. 1. *Ch. octofasciatus*, Gm., Bl., 215. *H. collare*, Bl. 216.

[2] *Chæt. Meyeri*, Bl., Schn., improperly called *Holocanthe jaune et noir* by Lacép. IV. xiii. 2.

[3] *Chæt. miliaris*, Cuv., Zool. Voy. Freycin, pl. lxii. f. 5.

[4] *Chæt. Kleinii*, Bl. 218. 2. *Ch. Sebæ*, Cuv., Seb. III. xxvi. 36.

[5] *Chæt. vittatus*, Bl., Schn., Seb. III. xxix. 18. *Ch. vagabundus*, Bl. 204. *Ch. decussatus*, Cuv., Russ. 83; and Klein. Mis. IV. ix. 2. *Ch. bifascialis*, Cuv., Voy. de Freycin. pl. lxii. f. 5. *Ch. strigangulus*, Gm. *Ch. baronessa*, Cuv., Renard I. xliii. 218. *Ch.*

One or two ocellated spots are observed in some[1].

Some of these chætodons, properly so styled, are distinguished from the others by a filament formed by the prolongation of one, or several, of the soft rays of the dorsal[2].

Finally, some are remarkable for the very small number of the spines of their dorsal[3]. These species are new, as well as many others of the preceding subdivisions, and will be described in our ichthyology.

CHELMON, *Cuv.*

Separated from chætodon on account of the extraordinary form of the snout, which is long and slender, only open at the extremity, and formed by a most excessive prolongation of the intermaxillary, and the lower jaw. Their teeth are very fine and crowded, rather resembling the pile of velvet than hairs.

One species, *Chæt. rostratus*, Lin., Bloch., 202, has the faculty of spurting drops of water on the insects it perceives on the shore, and thus bringing them

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frontalis, Cuv., or *Pomacentre croissant*, Lacép. *Ch. fasciatus*, Forsk., or *Ch. flavus*, Bl., Schn., No. 37.

[1] *Ch. nasogallicus*, Cuv., Ren. I. v. 37; and Will., App. V. 4. *Ch. capistratus*, L., Seb. III. xxv. 16. Mus. Ad. Fred. xxxiii. 4; Klein. Misc. IV. xi. 5. *Ch. bimaculatus*, Bl. 219. 1. *Ch. plebeius*, Gm. *Ch. unimaculatus*, Bl., 201. 1. *Ch. sebanus*, Cuv., Seb. III. xxv. 11. *Ch. ocellatus*, Bl. 211. 2.

[2] *Chæt. setifer*, Bl. 426. 1. *Ch. auriga*, Forsk. *Ch. principalis*, Cuv., Ren., part II. lvi. 239. Valent., No. 407.

[3] These species are new, as well as many others which belong to preceding divisions. They will be described in our ichthyology.

within reach. It is a common pastime of the Chinese at Java[1].

HENIOCHUS, *Cuv.*,

Differs from the true chætodon, because the first spines of the back, and particularly the third or fourth, rapidly increase in length, forming a filament sometimes double the length of the body, and resembling a kind of whip[2].

EPHIPPUS, *Cuv.*,

Distinguished by a dorsal deeply emarginated between its spinous and soft portions; the spinous part, which has no scales, can be folded into a groove, formed by the scales of the back.

In one of the subdivisions there are three spines in the anal fin and oval pectorals.

America produces a species, *Eph. gigas*, Cuv., remarkable for the great club-shaped enlargement of the first interspinal of its dorsal and anal fins, and for a similar inflation of the crest of the cranium[3].

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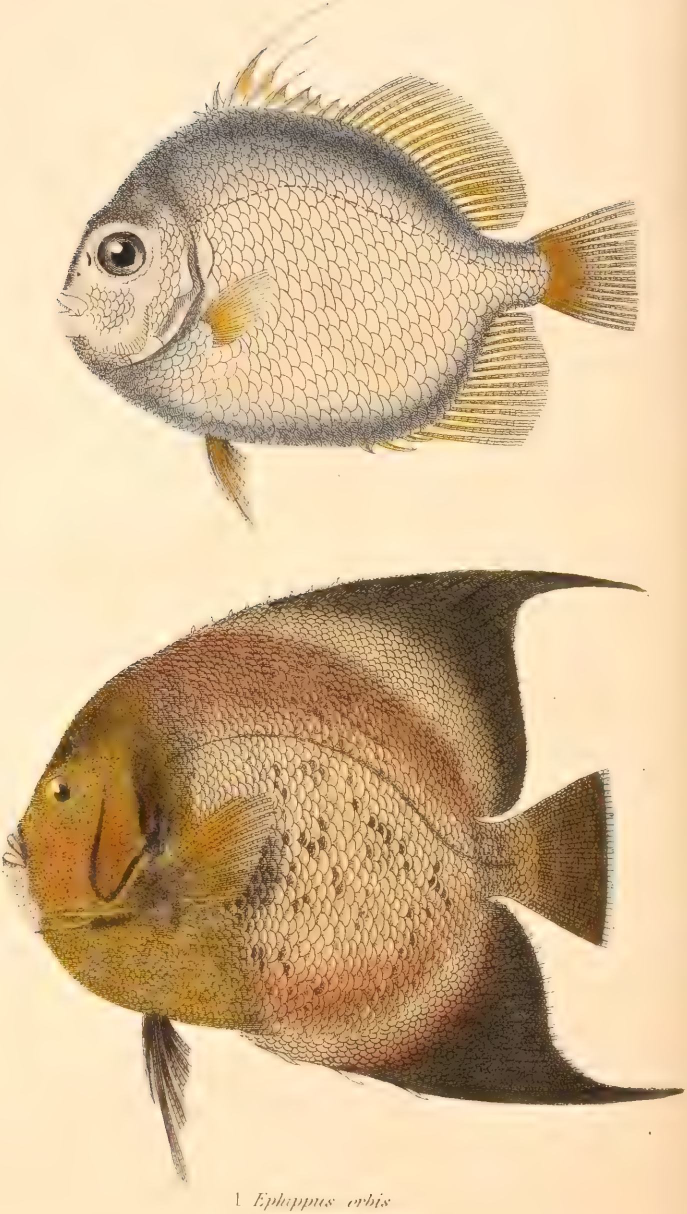
[1] Schlosser, Trans. Phil. 1767. p. 39. Add *Ch. longirostris*, Brousson, Dec. Icthyol.

[2] *Chætodon macrolepidotus*, L., Bl. 200. 1; the *Chæt. acuminatus*, L., Mus. Ad. Fred. xxxiii. f. 2. appears to be a mere variety of it; the *Chæt. cornutus*, L., Bl., 200. 2. of which the *Chæt. canescens*, L., Seb. III. xxv. 7. is only a young uncoloured specimen.

[3] Add *Chætodon faber*, Brousson, Bl. 212. 2. of which the *Chæt. Plumieri*, Id. 211. 1. may be a variety. *Chæt. orbis*, Bl. 202. 2.



1 *Ephippus orbis*

2 *Pomacanthus aureus.*

In a second subdivision from the Indian Ocean, there are three spines in the anal, and long and pointed pectorals [1].

A third, also from the Indian Ocean, has four anal spines, and very small scales.

One species, *Chætodon argus,* L., Bl. 204. 1. has the reputation of feeding, in preference, upon human excrement [2].

Another species of this same subdivision has been discovered in a fossil state in Mount Bolca [3].

The TAURICHTES are *Ephippii* of India, which have an arcuated and pointed horn over each eye [4].

HOLACANTHUS, *Lacep.*,

A large spine at the angle of the preoperculum, and the edges of the same bone in most species denticulated. Their flesh is excellent, and they are remarkable for the beauty of their colours, and the regularity with which they are distributed. Numerous specimens abound in both oceans [5]. Their form is oval or oblong.

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[1] *Chæt. punctatus,* L., or *Latté,* Russ. 79. *Chæt. longimanus,* Bl., Schn., Russ. 80. *Eph. terla,* Cuv., Russell 81.

[2] Add *Chæt. tetracanthus,* Lacép. III. xxv. 2.

[3] Ittiolitologia Veronese, pl. v. f. 2. where it is figured as the Argus, but it is a different species.

[4] The *Buffalo-fish* of the Malays, *Taurichthys varius,* Cuv., well figured by Ren. I. xxx. 164. Valent. No. 71. *T. viridis,* Ren. II. x. 49. Valent. No. 161.

[5] American species, *Chæt. ciliaris,* L., Bl. 214, or *Isabelita,* Parra VII. 1. or *Chæt. couronné,* Desmar., Dec. Icthyol. *Chæt. tricolor,*

POMACANTHUS, *Cuv.*,

In which the form is more elevated, a circumstance resulting from the more sudden rise of the edge of the dorsal. The only species known are from America[1].

PLATAX.

A row of trenchant teeth, each divided into three points in front of the other, or brush-like teeth. The body, strongly compressed, seems to be continued into thick, vertical, elevated, and scaly fins, in whose anterior edge some few spines are concealed, so that the whole fish is much higher than it is long; very long ventrals. The Indian Ocean[2].

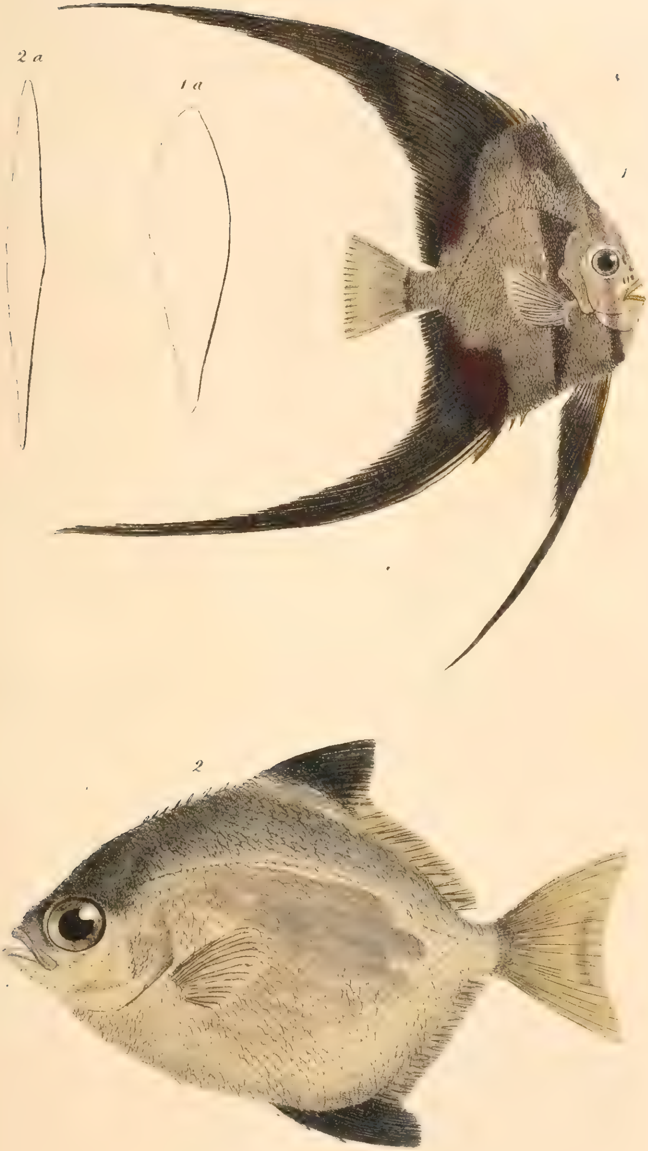
One species, *Ch. arthriticus*, Bell. Phil. Trans. 1793. pl. vi. of a more orbicular form, is remarkable for the knots, or enlargements, in some of its interspinals, and spinous processes[3].

Bl. 425, Duham., Sect. IV. pl. xxiii. 5. India species, *Chæt. bicolor*, Bl., 206. 1. *Ch. mesoleucos*, Bl., or *mesomelas*, Gm. Bl. 216. 2. *Holac. amicalis*, Cuv., Ren. I. xvi. 92. *Ch. annularis*, Bl. 215. 2. *Ch. imperator*, Bl. 194. *Ch. fasciatus*, Bl. 195. *Ch. nicobariensis*, Bl. Schn. 50., or *Geometricus*, Lacép. IV. xiii. 1. *Hol. Lamark*, Lacép. iv. 531. Renard I. xxvi. 144, 145. and several new species.

[1] *Chæt. aureus*, Bl. 193. 1., or *Chirivita jaune*, Parra vi. 2. *Chæt. paru*, Bl. 197., or *Chirivita noir*, Parr. vi. 1. *Ch. 5-cinctus*, Cuv. *Guaperva*, Marcgr. 178. *Ch. arcuatus*, L., Bl. 204. 2.

[2] *Chæt. vespertilio*, Bl. 199. 2. *Ch. teïra*, ib. 1. *Ch. guttulatus*, Cuv., Ren. II. xxiv. 129.

[3] It is also the *Ch. pentacanthe*, Lacép. IV. xi. 2., and the *Ch. orbicularis*, Forsk., or *Acanthinion orbiculaire*, Lacép. IV. 500.



1 *Platax Gaimardi.*

2 *Psettus rhombeus.*

A fossil species of this subdivision has also been discovered at Mount Bolca[1].

PSETTUS, *Commers.*

Figure similar to that of a Platax, but the teeth are very small and crowded, and the ventrals reduced to a single small spine, without soft rays.

The form of some is elevated[2]; that of others round or oval[3]. They are all from the Indian Ocean.

PIMELEPTERUS, *Lacep.*

Distinguished from all other fishes by a single range of teeth placed in a horizontal base or heel, on the anterior edge of which is a part vertical and trenchant. The body is oblong, the head obtuse, and the fins thickened by the scales which cover them, from which circumstance their name is derived[4]. They are oval, smooth, and covered with brown scales; they inhabit both oceans[1].

---

[1] Ittiol. Veron. pl. iv. and vi.

[2] *Psett. Sebæ*, Cuv., *Chætodon, rhombeus*, Bl., Schn., Seb. III. xxvi. 21. *Ps. rhombeus*, Cuv., or *Scomber rhombeus*, Forsk., or *Centrogaster rhombeus*, Gm. or *Centropode, rhomboïdal* Lacép., Russ. 59.

[3] *Psett. Commersonii*, Cuv., or *Monodactyle falciforme*, Lacép. II. v. 4. and iii. 131. which very probably does not differ from the *Chæt. argenteus*, L., or *Acanthopode, argenté*, Lacép.

[4] *Pimelepterus* (fat fin). This genus of Lacépède, iv. 429. formed from Bosc, is the same as that of XISTERES, v. 484. formed from Commerson; and there is every reason to believe that the *Dorsuaire*, Lacép., v. 482. which is certainly identical with the KYPHOSE, iii. 114. may very possibly also be the same as the XISTERUS.

DIPTERODON[2].

A neighbouring genus, in which the teeth are also trenchant, but cut sloping, and not bent at an angle; the spinous portion of the dorsal separated from the soft part by a deep emargination. This genus, the name of which is borrowed from Lacépède, does not however contain the same species.

Dipt. capensis, Cuv., is the only species known.

The following genera, which we place next to chætodon on account of their scaly fins, differ greatly from it, however, in the teeth with which their palatines and vomer are furnished. The genus

BRAMA, Bl., Schn.,[3]

Is connected with this family, the scales, covering the vertical fins, which have but a small number of

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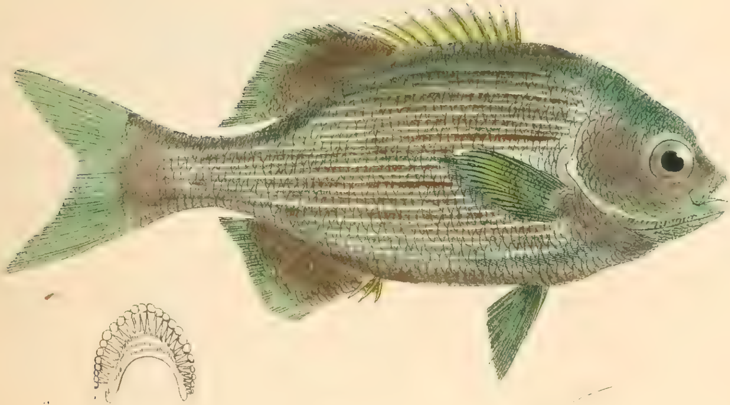
[1] The *Piméloptère bosquien*, Lacép. IV. ix. 1. or *Chætodon cyprinaceus*, Broussonet. The *Pim. marciac*, Quoy and Gaym., Voy. Freycin. pl. lxii. f. 4. *Pim. du Cap*, or *Kiphose double bosse*, Lacép. III. viii. 1. A Brazil species formerly named by Banks *Chætodon ensis*.

[2] This genus, the name of which is borrowed from Lacép. does not, however, contain the same species.

[3] I strongly suspect that it is the Brama which M. Rafinesque has in view, in his *Lepodus saragus*, Nuov. Gen. No. 144. Shaw makes two species of it, but why, it is impossible to say, the *Sp. Raii*, and *Sp. castaneola*, the latter after Lacép., but Lacép. made his genus only for the species of Bloch and Ray.

1



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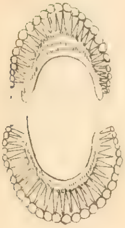

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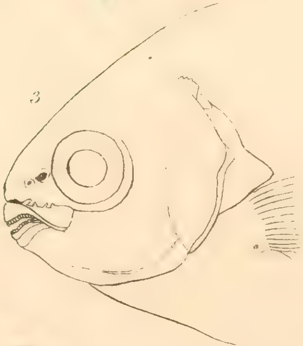

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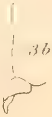

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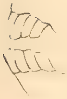

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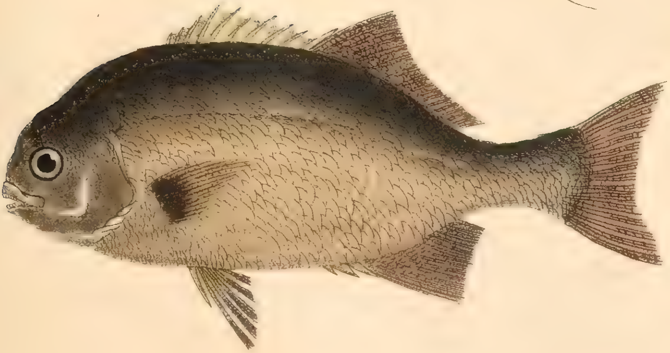
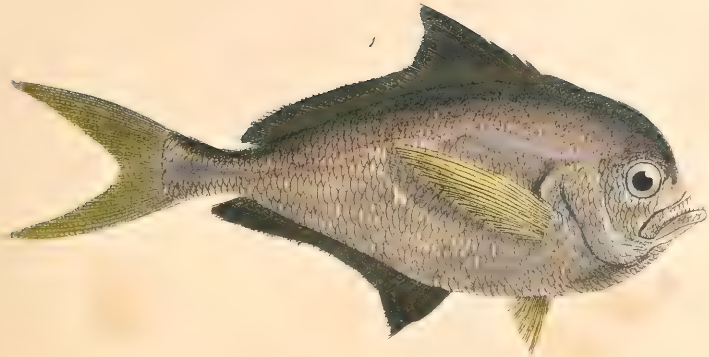


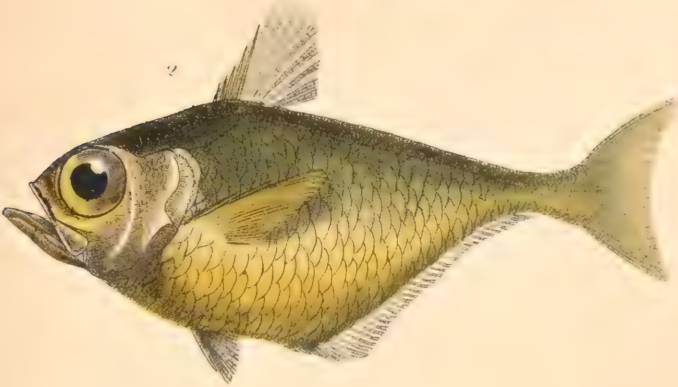
1 *Pimelepterus altipinnis*

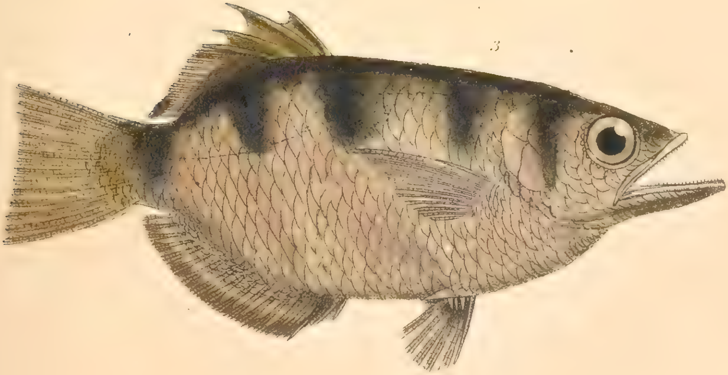
2 *Dipterodon capensis*

3 *Head of Pimelepterus Boscii.*

London. Published by Whittaker & Co. Ave Maria Lane 1834







1 *Brama Raii*

2 *Pempheris mexicana*

3 *Toxotes jaculater*

spinous rays concealed in their anterior edges; but they have slender, bent teeth, in the jaws, and palatines, an elevated profile, very short snout, a forehead descending vertically, and a mouth, when shut, that is almost vertical. The scales extend on to the maxillaries; there are seven rays to the branchiæ; a dorsal and an anal, not prominent though commencing in a salient point; a short stomach; a small intestine, and only five cœca.

But one species is known, *Sparus raii*, Bloch. 273; it inhabits the Mediterranean, and sometimes strays into the ocean. An excellent fish of a burnished steel colour, which attains a large size, but is infested with various species of intestinal worms.

I strongly suspect that it is the Brama, which M. Rafinesque had in view in his *Lepodus saragus*, Nuov. Gen., No. 144. Shaw makes two species of it, but why, it is impossible to say, the *Sp. Raii* and *Sp. castaneola;* the latter after Lacépède, but Lacépède made his genus only for the species of Bloch and Ray.

PEMPHERIS, *Cuv.*

Have the anal long and scaly, and the dorsal short and elevated, the head obtuse, the eye large; a little prickle at the operculum, and even teeth at the jaws, vomer and palatine bones. They inhabit the Indian seas[1].

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[1] *Pempheris touea*, C., *Sparus argenteus*, J. White, App. 267., or

TOXOTES, *Cuv.*

Have the body short and compressed; the dorsal on the latter half of the back, furnished with strong spines, the soft part scaly, as also the anal, which corresponds with it; the snout depressed and short; the lower jaw more prominent than the other; the teeth very even at the two jaws, at the end of the vomer, at the palatines, at the pterygoïdeans, and on the tongue; six rays at the gills, the suborbital and the preoperculum delicately denticulated at the lower edge. Their stomach is short and wide; there are twelve cœcal appendages to the pylorus; the air-bladder is large and thin.

The known species (*Toxotes jaculator*, Cuv.), *Labrus jaculator*, Shaw, iv. part ii. p. 485. pl. lxviii.[1] From Java; is celebrated for the instinct it possesses in common with the *Chæt. rostratus*, of darting drops of water on insects which are on aquatic plants, thereby causing them to fall into the water, and become its prey. They shoot them sometimes three or four feet high, and seldom miss their aim.

The seventh family of the ACANTHOPTERYGII, or the

Kurtus argenteus, Bl. Schn. 164. *P. mangula*, Cuv., Russell 114. *P. molucca*, Cuv., Renard i. 15. 85. and Valent. No. 46.

[1] It is also the *Scarus Schlosseri*, Gmel., Lacép., and Shaw; the *Sciæna jaculatrix* of Bonnaterre; the *Labre sagittaire* of Lacép.; and the *Coïus chatareus* of Buchanan.

SCOMBEROIDES,

Consists of a great many fish with small scales, smooth bodied, with numerous cœca, often in bunches; the tail, and particularly the caudal fin, are very powerful.

It is one of the families most useful to man, from the agreeable flavour of its species, from their size, and from their inexhaustible re-production, which brings them periodically to the same latitudes, and makes them the object of the most extensive fisheries.

The SCOMBRI.

Have their first dorsal entire, whereas the latter rays of the second, and also the corresponding ones of the anal, are detached, and form what have been called spurious fins *(pinnæ spuriæ.)*

This genus is subdivided as follows:

The MACKEREL, (SCOMBER, *Cuv.*)

Have a spindle-shaped body, covered with uniformly small smooth scales; the sides of the tail turned up with two cutaneous crests; the second dorsal separated from the first by an empty space.

The *common Mackerel,* (*Scomber scombrus,* L.), Bl. 54.

Has a blue back, with wavy black stripes, five spurious fins above and below; its flesh is very firm, and excellent eating: it abounds in summer on our coasts, when the fisheries are almost as productive as those of herrings. Sometimes they appear at other seasons:

those early in the spring, generally smaller, are called in French *sansonnets*.

The common mackerel has no natatory bladder; but, what is very remarkable, this organ is to be found in many other species in other respects so like as to be scarcely distinguishable, such as the *little mackerel* of the Mediterranean, (*Sc. cobias, Sc. pneumatophorus*, Laroche, Ann. Mus. 13.), and the *Sc. grex*, Mitch., Trans. New York i. 423., which comes sometimes on the coast of the United States in a prodigious quantity, &c.[1]

THYNNUS, *Cuv.*

Have round the thorax a sort of necklace, formed by scales larger and less smooth than those of the rest of the body. The sides of the tail have a cartilaginous keel between the two little crests of the mackerel. Their first dorsal extends nearly to the second.

The *common Tunny*, (*Sc. thynnus*, Lin.)

This fish, peculiar to the Mediterranean, is of the greatest antiquity, and is a great source of riches to Provence, Sardinia, Sicily, &c., by the great abundance in which it is caught, and prepared with salt, oil, &c. It is said to attain from fifteen to eighteen feet in length, and has nine spurious fins above, and as many below. Its pectorals are the fifth part of its length.

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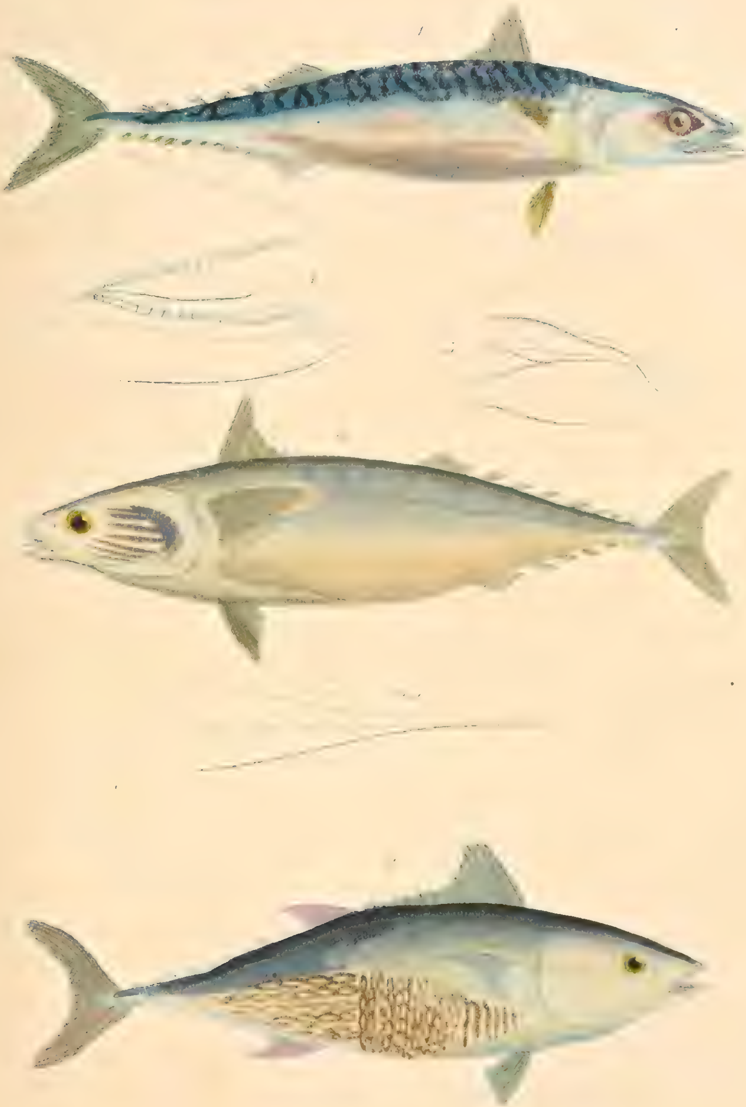
[1] Add *Scomber vernalis*, Mitch. loc. cit. *Sc. canagurta*, Cuv., Russell 136.



1. Scomber [illegible]

2. Thynnus vulgaris.

3. Auxis Pelei.

4. [illegible] vulgaris.

5. [illegible] pelamys.

There are in the Mediterranean many similar species, but as yet imperfectly described.

The *Alicorti* (*Sc. brachypterus*, C.) Rondel 245. and Duham. sect. vii. pl. vii. f. 5.

Of which the pectorals are only an eighth part of the total length.

Sc. thunina, C., Aldrov. 315. Descrip. de l'Eg. Poiss. pl. xxiv. f. 5.

Of a bright blue, with black lines waved and twisted in divers ways, &c.

In this first group also we must place

The *Bonita* of the tropics, or *striped-bellied Tunny*, *Sc. pelamys*, L., Lacép. ii. 20. 2.

Which has four longitudinal blackish bands on each side of the belly [1].

ORCYNUS, *Cuv.*

Differ from the tunny only in the length of their pectorals, which are a third of the length of their body, and reach beyond the anus.

The *Germon* of the Biscayans, *Alalonga* of the Italians (*Sc. alalonga*, Gm.) Duham. sect. vii. pl. vi. f. 1., under the incorrect name tunny, *Willughb.* App. pl. ix. f. 1.

Is caught in the Mediterranean, with the tunny, and in summer comes in multitudes to the Bay of Biscay, and is the object of extensive fisheries: the back is of a blackish blue gradually softening into the silvery colour of the belly; it is often found to weigh eighty pounds; its flesh is much whiter than that of the tunny.

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[1] Add *Sc. coretta*, Cuv., Sloane, Jam. i. 1. 3.; *Dangiri mangelang*, Renard I. lxxvi. 189.

AUXIS, *Cuv.*[1]

Have, with the corselet and moderate sized pectorals of the tunny, the dorsals separated, like those of the mackerel.

Some are found in the Mediterranean.

The *Bonitou*, or *Scomber Laroche* of Risso, or *Scomber bisus*, Rafinesque, Caratt, pl. ii. f. 1. Egypt 24. 6.

Has a fine blue back, blackish oblique lines; flesh of a dark red colour.

There is another in the Antilles, which is there called *tunny*, and which grows as large as the European tunny[2].

SARDA, *Cuv.*[3]

Are distinguished from the tunny merely by pointed distinct teeth, and tolerably strong.

But one species is known, which abounds in the Black Sea and in the Mediterranean. (*Scomber sarda*,

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[1] *Auxis*, the ancient name of a fish of the family of the tunny.

[2] Add the *Tasard*. Lacép. iv. p. 8.; the *Albicore*, Sloane, Jam. i. 1. 1.

[3] *Sarda* was the ancient name of the tunny caught and salted in the Western Ocean.

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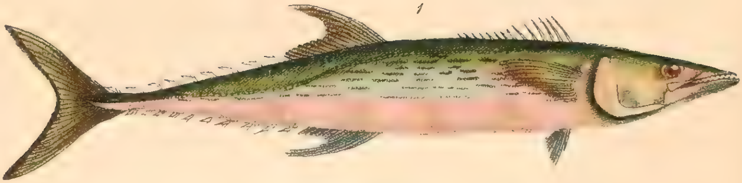

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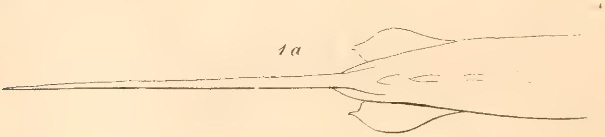

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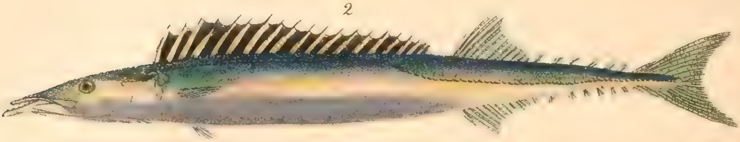

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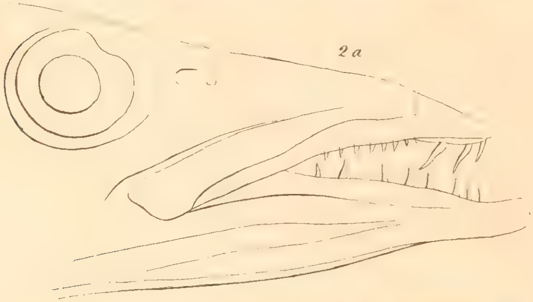

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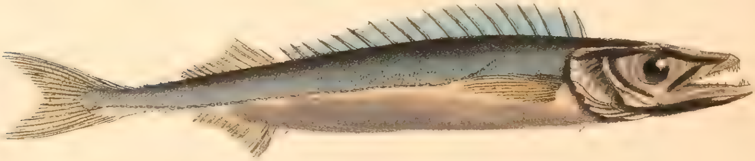

1 *Cybium lineolatum*

2 *Thyrsites chilensis.*

3 *Gempylus prometheus.*

London Published by Whittaker & Cº. Ave Maria Lane 18 4

Bl. 334. Aldrov. 313. Salvian 123. Bélon 179[1].) Blue, with the back striped obliquely blackish: it also inhabits the two oceans. It is a fish remarkable for the extreme length of its gall-bladder, which was spoken of by Aristotle[2].

CYBIUM, *Cuv.*[3]

Have a long body, without corslet, and large, compressed, sharp teeth. Their palatines have only short even teeth. There are several in the warm parts of the two oceans, of which some grow to a good size[4].

THYRSITES[5].

Differ from the cybiums by having their anterior teeth longer than the others, and pointed teeth also on their palatines; their tail has no lateral keel. This subgenus leads distinctly to the lepidopi and to the trichiuri[1].

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[1] It is the *Amia* of the ancients, and of Rondelet, 238. The *Sarda* of Rondelet, 248. is this fish when young: it is also the *Scomber palamitus* of Rafinesque; the *Sc. ponticus* of Pall., Zoogr. Russ.

[2] Arist. Hist. ii. c. xv. The common tunny has the gall-bladder quite as long.

[3] *Cybium*, ancient name of a preparation from the tunny, and of a fish of the same family.

[4] *C. Commersonii*, C., *Sc. Commersonii*, Lacép., or *Konam*, Russell 135. *C. lineolatum*, C., *Mangelang*, Russ. I. vii. 53. *C. guttatum*, C., or *Sc. guttatus*, Bl. Schn. pl. v.; *Vingeram*, Russell 134. *C. maculatum*, or *Sc. maculatus*, Mitch., Trans. New York, I. vi. 8. *C. regale*, C., or *Sc. regalis*, Bl. 333., which is also the *Scomberomore plumier*, Lacép. iii. 293.; *C. cavalla*, or *Guarapuca*, Margr. 178.

[5] Ancient name of a fish of this family.

GEMPYLUS[2].

Resemble the thyrsites by the jaw-teeth; but their palate is destitute of teeth, and their ventrals are almost imperceptible, which also brings them nearer to the lepidopi[3].

XIPHIAS, *Linn.*

Belong to the scomberoides, and are nearly allied to the tunny by their very small scales, by the keels on the sides of their tail, by the strength of their caudal fin, and all their interior organization.

Their distinctive character consists in the beak or long point shaped like a sword or spit, which terminates their upper jaw, and forms a very powerful weapon, with which they attack the largest marine animals. This beak is composed principally of the vomer and inter-maxillary bones, and is strengthened at its base by the ethmoïd, the frontal, and maxillary bones. Their gills are not pectinated, but each formed of two large parallel laminæ, the surface of which is reticulated[4].

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[1] *Scomber dentatus*, Bl. Schn., or *Sc. atun*, Euphrasen and Lacép. or *Acinacée batarde*, Bory Saint Vincent.

[2] Ancient name of an unknown fish.

[3] *Gempylus serpens*, C., or *Serpens marinus compressus lividus*, Sloane i. 1. f. 2.

[4] It was from this that Aristotle said that the Xiphias has eight gills.

Fish Pl 27

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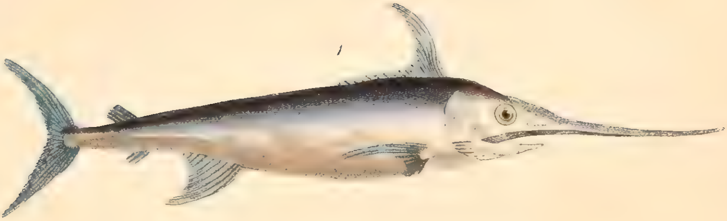

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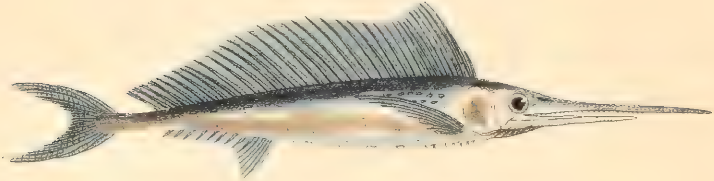

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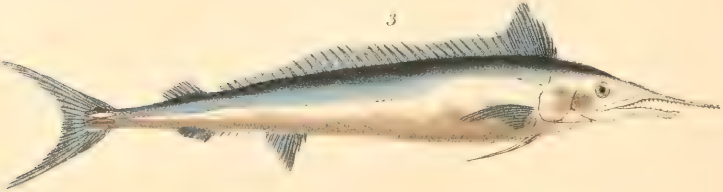

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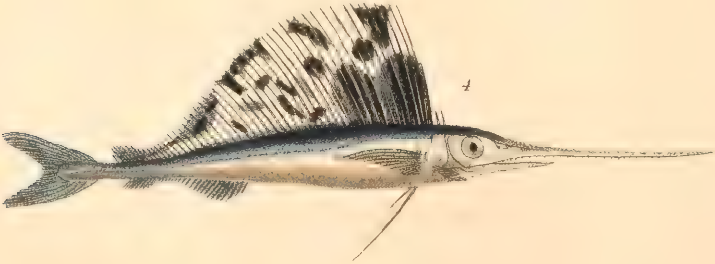

1 *Xiphias gladius*

2 *Young of same*

3 *Tetrapturus belone.*

4 *Histiophorus pulchellus.*

[illegible]

Their swiftness is excessive; they are good eating.

XIPHIAS (proper), *Cuv.*

Have no ventrals: one species only is known.

The *common Sword-fish*, (*Xiphias gladius*, L.)

The point flattened horizontally, and sharp, like a broad-sword blade. The sides of the tail are deeply carinated. It has but one dorsal, which rises both from the front and back, and the middle of which wears out with age, so that it appears to have two. It is one of the largest and best fish of our seas; they are often met with of fifteen feet or more. It is more common in the Mediterranean than in the ocean. A parasitical crustaceous animal[1] penetrates into its flesh, and maddens it to such a degree that it darts itself on the shore[2].

TETRAPTURUS, *Rafinesque.*

Have the point of the snout in the shape of a stiletto, and the ventrals consisting of one unjointed bone each. At each side of the insertion of the caudal are two little prominent crests like those of the mackerel.

There is one in the Mediterranean,

Tetrapturus belone, Rafin., Caratt. pl. i. f. 1.

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[1] It is called mal à propos by Gmel. *Pennatula filosa.*

[2] N.B. The *Xiphias imperator*, Bl. Schn. pl. xxi. taken from Duhamel, sect. iv. pl. xxvi. f. 2. is merely a copy from a bad plate given by Aldrovandus (Pisc. p. 332.) as that of the common *xiphias*. The species called *imperator* must then disappear.

MAKAIRA, *Lacép.*

Have the point and the two little crests of the tetrapturus, but no ventrals.

Only one has ever been seen, taken near the Isle of Re, in 1802, (*blackish makaira,* Lacép., *Xiphias makaira,* Sh.[1])

ISTIOPHORUS, *Lacép.*, NOTISTIUM, *Herman.*

Have the beak and tail-crests like the tetrapturi, but their dorsal is very elevated, and serves to catch the wind when they swim; their ventrals, long and slender, consist of two rays.

There are a few more species as yet imperfectly determined, one of which of the Indian seas, (*Scomber gladius,* Broussonet, Acad. des Sc. 1786, pl. x.) *Xiphias velifer,* Bl. Schn., *Xiphias platisterus,* Shaw, part ii. p. 101., has been long since described[2].

All these fishes are very large.

CENTRONOTUS, *Lac.*,

Are one extensive genus of well defined scomberoïdes, because the prickles which, in the acanthopterygians in general, form either the anterior part of the dorsal or a first distinct dorsal, are in these detached and not united by a common membrane; their ventrals are never wanting. They are subdivided as follows:

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[1] It is not quite ascertained whether it was not a tetrapturus that had lost its ventrals. The figure of M. de Lacép. IV. xiii. 3. is taken from the rough drawing of a fisherman.

[2] It has also been represented by Nieuhoff, ap. Willughb. app. pl. v. f. 9. by Renard, i. pl. xxxiv. f. 182. and 11. pl lvi. f. 233, by Valentyn, No. 527. The *Guebucu.* Marcgr. 171. appears scarcely to differ from the species of the Indies. Bl. 345, is a bad copy of a figure by the Prince Maurice, which differed much less from that of Marcgrave.

NAUCRATES, *Rafin.*,

Have, besides the detached prickles of the back, a spindle-shaped body, and a keel at the sides of the tail, like the tunny, and two separate prickles in front of the anal.

The common species, or the *fanfre* of our Provençal sailors, (*Garterosteus ductor*, Lin., *Scomber ductor*, Bl. 338) is blue, with wide vertical stripes of a darker blue. It takes its name *(Pilot-fish)* from its custom of following the ships to catch all that falls from them, and as the shark has also this custom, travellers have said that it acts as guide to the shark. Its length is scarcely more than one foot.

There is a black species, the *Ceixupira,* Marcgr. 158, (*Scomber niger,* Bl. 337) which reaches eight or nine feet in length.

ELACATE, *Cuv.*

Have the same general form as the pilots, and their detached prickles on the back; but their head is flattened horizontally, and they have neither keel at the tail, nor detached prickles before the anal[1].

---

[1] *El. motta*, C. *Pedda mottah*, Russel. 153.; *El. Americana*, C., *Centronotus spinosus*, Mitch. Ann. cit. Nov. I. iii. 9. which is probably the *Gasterosteus canadensis*, L., and some new species.

LICHIA, *Cuv.*,

Have, besides the detached prickles of the back, and two others before the anal, the body compressed, and the tail without lateral keels. In front of the prickles of the back is one inclined forward.

The Mediterranean contains three species, already well described by Rondelet, and all good eating.

The *Lichia* proper, or *Vadigo*, (*Scomber amia*, L.) Rondel. 254. *Amia*, Salv. 121.

Has a lateral line bent like the letter S; a large species which attains more than four feet in length, and sometimes weighs a hundred pounds.

The *Derbio*, Rond. 252. (*Sc. glaucus*, L.)

With the lateral line nearly straight; the anal and the second dorsal marked with a black spot in front; teeth short and even.

L. sinuosa, *Cuv.*

The *Liche sinueuse* of Rondelet, 255. The blue of the back divided from the silvery of the belly by a zigzag line, hooked teeth all in one row[1].

M. de Lacépède separates from Lichia, under the ill chosen appellation of SCOMBEROIDES, those species in which the latter rays of the second dorsal and anal are divided into spurious fins, as in the scombri proper[2].

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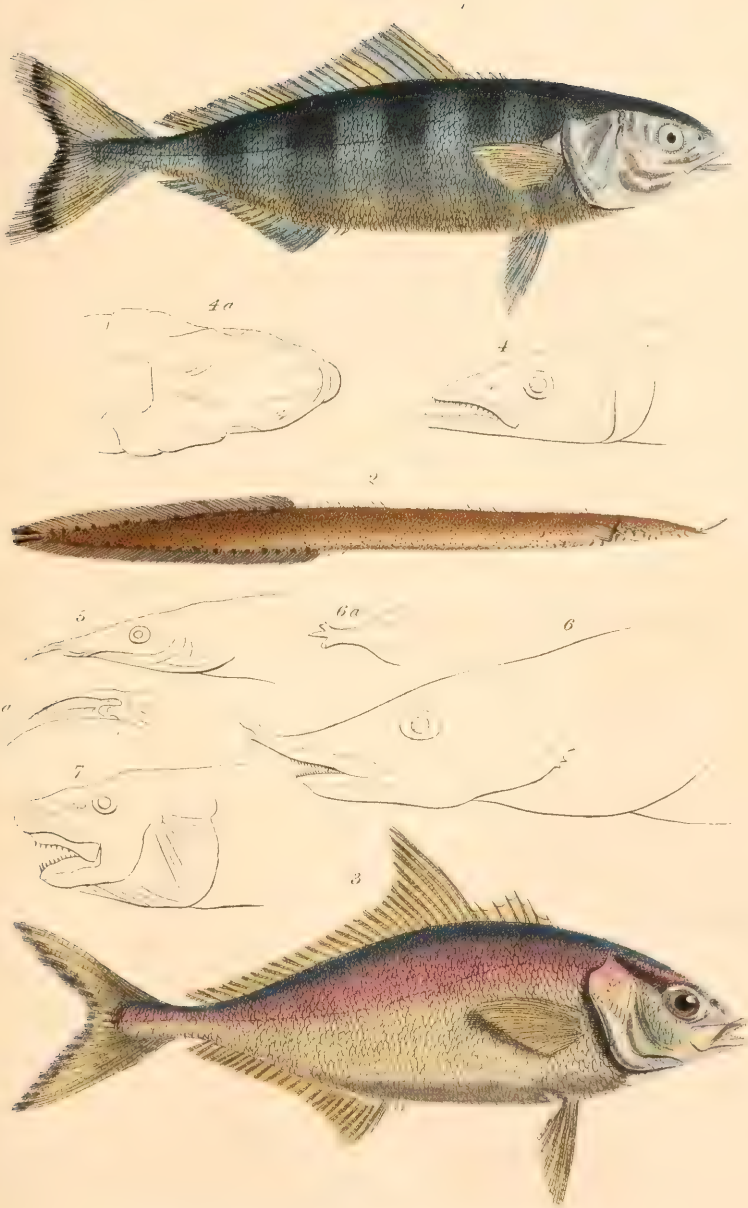
[1] Add. *Scomb. calcar*, Bl. 336. f. 2.

[2] *Scomber. Forsteri*, Bl. Schn., or *Scomberoïde commersonien*,



1 *Naucrates indicus*

2 *Mastacemblus maculatus*

3 *Seriola Rivelii*

4 *Head of Elacate atlantica.*

5 „ *Rhynchobdella aral*

6 „ *Mastacemblus armatus*

7 *Head of Notacanthus nasus*

TRACHINOTUS, *Lacep.*

From which his ACANTHINIONS and CÆSIOMORES do not differ generically, are lichias, with the body elevated, profile more vertically shortened, the dorsal and anal sharpened into more elongated points[1].

RHINCHOBDELLA, *Bl. Schn.*,

Have detached prickles on the back, like the centronotus, and two before the anal, but they are deficient in ventrals, like the xiphias proper. Their body is long.

There are two subgenera. In

MACROGNATHUS, *Lacép.*

The snout is lengthened into a cartilaginous point, which projects beyond the lower jaw; the second dorsal and the anal are distinct from the caudal[2]. In

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Lacép. II. xx. 3. or *Aken parah*, Russell 141; *Tolparah*, Russell 138; *Sc. aculeatus*, Bl. 336. 1; *Sc. lysan*, Forsk.; *Sc. saliens*, Bl. 335, and Lacép. ii. 19; *Gasterosteus occidentalis*, L., Brown, Jam. xlvi. 2; *Quiebra-acha*, Parra xii. 2.

[1] *Chætodon glaucus*, Lacép. 21 ³, or *Acanthinion bleu*, Lacép. iv. 500; *Chæt. rhomboides*, Bl. 209, or *Ac. rhomboide*, Lac.; *Gasterosteus ovatus*, L., or *Mookalee parah*, Russ. 154; *Cæsiomore*, Bloch. Lacép. III. iii. 2; *Scomber falcatus*, Forsk.; *Cæsiomore baillon*, Lacép. III. iii. 1; *Botlah-parah*, Russell 142.

[2] *Rhynchobdella orientalis*, Bl., Schn., or *Ophidium aculeatum*, Bl. 159. 2., or *Macrognate aiguillonné*, Lacép. II. viii. 3.; *Rh. polyacantha*, Bl., Schn., or *Macrognate armé*, Lacép., Buchan. pl. xxxvii. x. 6; *Rh. aral*, Bl., Schn., pl. lxxxix. *Macrogn. pancalus*, Buchan. xxii. 7.

MASTACEMBELUS, *Gronov.*,

The two jaws are nearly equal, and the caudal and anal nearly united at the caudal [1].

Both kinds are found in the Asiatic rivers and lakes, and feed upon worms that they find in the sand. Their flesh is esteemed.

Perhaps it is here that ought to be placed a genus of which, as yet, but imperfect notions are entertained, that of the

NOTACANTHUS, *Bl.* (CAMPILODON, *Oth. Fabric.*)

Their body is very long, compressed, covered with soft small scales, their snout obtuse, projects beyond the mouth, which is furnished with fine and close teeth; there are only detached prickles on the back; the ventrals are behind under the abdomen; a very long anal reaches to the end of the tail, where it unites with a very small caudal.

One species only is known *(Notacanthus nasus,* Bl. 431) of the Frozen Ocean, two feet and a half long.

SERIOLA, *Cuv.*,

Present the same characters as the lichias: an inclined prickle before the first dorsal, a little detached fin, supported by two prickles before the anal; compressed body, lateral line without keel or armour, but the spines of their first dorsal are united by a membrane so as to form a fin.

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[1] *Rhynchobdella halepensis*, Bl., Schn.; Gronov. Zooph. pl. viii. and x.

One of its species, the *pèche lait* of our colonists at Pondicherry (*Scomber lactarius,* Bl. Schn.), Russel 108, is remarkable for the extreme delicacy of its flesh. Another, *Seriola cosmopolita,* C., *Scomber chloris,* Bl. 339, as being one of the small number of fish found in either ocean [1].

One of its species have the last ray of the dorsal and of the anal detached (*Seriola bipinnulata,* Cuv.) Zool. of Freycin. pl. lxi. f. 3.

NOMEUS, *Cuv.*,

Long considered as one of the gobii, are closely connected with seriola, but have very large ventrals, which, united to the body by the internal edge, give them a distinct character.

One species is found in the American Seas, the *Harder,* Marcgr. 158. (*Nomeus Mauritii,* C.) silvery, with transverse black bands on the back [2].

---

[1] Add. *Sériole* Dumeril, Risso; *Scomber fasciatus,* Bl. 341; *Sériole de Rafinesque,* Risso, or *Trachurus aquilus.* Raff. carat. 11. 3.

[2] It is the *Gobius gronovii,* Gmel. the *Gobiomore gronovien,* Lacép., the *Eleotris mauritii,* Bl., Schn., and the *Scomber zonatus,* Mitch., Trans. New York, i. 4. 3. It grows as large as a salmon. The other *Harder,* Marcgr. bras. 166, appears to be a mullet.—[*Harder,* or *Herder,* (Shepherd) is a name which the Dutch sailors give to divers fish, from notions analogous to those which have caused ours to give such names as *conductor, pilot,* &c.; and perhaps our *nomeus*

TEMNODON, *Cuv.*,

Have the tail unarmed, the little fin or the detached spines before the anal of the seriola; their first dorsal is fragile and low, the second and the anal are covered with small scales; but their principal character consists in a row of separated, pointed, and cutting teeth at each jaw; behind the upper ones is a row of smaller teeth, and there are some fine as velvet on the vomer, palate, and tongue. Their operculum finishes in two points, and they have seven rays to the gills.

One species only is well known, (*Temn. saltator*, C.) silvery, the same length as the mackerel, which is one of the few fishes common to both oceans [1].

CARANX, *C.*,

Are scomberoïdes characterised by a lateral line, armed over a greater or smaller space with scaly pieces or bands, carinated, and often prickly. They have two separate dorsals, a recumbent spine before the first, the last rays of the second but slightly attached, and sometimes separated, and forming spurious fins; de-

---

has been confounded with the common *pilot*, in consequence of the resemblance of its black bands.]

[1] We have it with scarcely any variation from Alexandria, the United States, from the Cape, and from New Holland. It is the *Cheilodiptère heptacanthe*, Lacép. iii. 21. 3. from Commerson, and his *Pomatome skib.* IV. viii. 3. from Bosc. It is also the *Perca saltatrix*, Linn., Catesb. ii. 8. 2. or *Spare sauteur*, Lacép.; add *perca antarctica*, Carmich. Trans. Lin. xii. 25?

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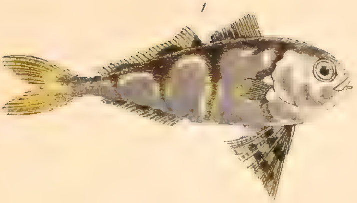

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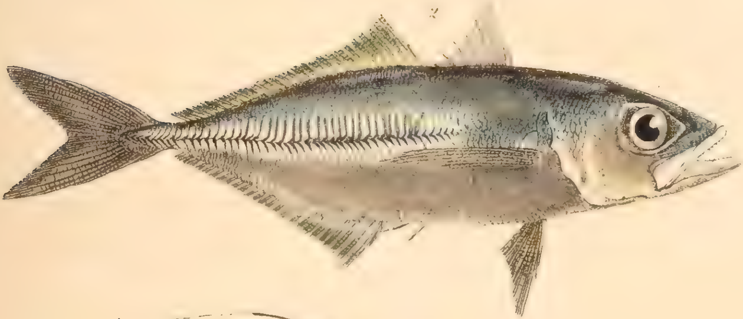

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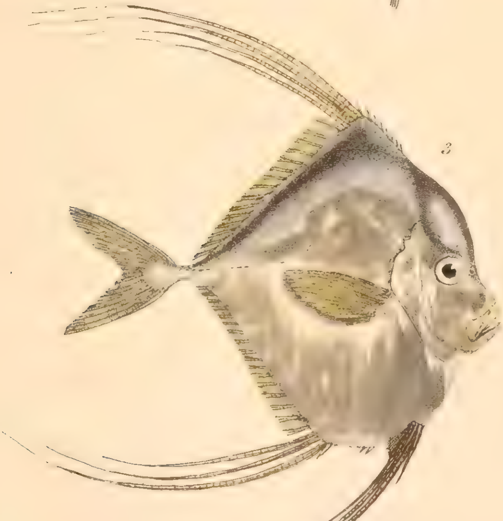

1. *Nomeus Peronii.*

2 *Caranx boops*

3 *Gallus ægyptiacus*

London, Published by Whittaker & Co. Ave Maria Lane 1834

tached spines, or if united, forming a little fin before the anal.

Our European seas produce many species in general form and taste like the mackerel, remarkable, because the bands or plates which cover their lateral line begin from the shoulder.

They are commonly confounded under the names *Saurels, Maqueraux batards,* &c. (*Scomber trachurus,* Lin.) but they differ in the number of their bands[1]; and the inflexion more or less sudden, of their lateral line. They are found as far as New Zealand very similar to ours.

The other caranges have laminæ only on the posterior and straight part of their lateral line; the anterior and arched part has only small scales.

There are some spindle-shaped, like the saurel of Europe; and among them some have one single spurious fin at the dorsal and anal[2]. Some have a good many[3]; but the greater part have none[4].

Some caranges, of which the body is more elevated, but which have the profile oblique and little convex, are remarkable for having but one row of teeth [1].

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[1] They have from seventy to one hundred bands.

[2] *Kurra-wodagahwah,* Russell 139; *Car. punctatus,* C., called *Scomber hippos* by Mitch. Trans. of New York, I. v. 5; but which is not the *hippos* of Linnæus. *Curvata pinima,* Marcgr. bras. 150.

[3] *Scomber Rotleri,* Bl. 346, and Russell 143; *Sc. cordyla,* L.; but not his synonyms, which are *Caranges.*

[4] *Scomber crumenophthalmus,* Bl. 343; *Scomber Plumieri,* Bl. 344, the same as *Sc. ruber,* 343, and as the *Caranx Daubenton,* Lacép. iii. 71.

Our sailors call CARANGUES, fish of this genus, with the body elevated, sharp profile, bent convexly, and falling suddenly. The species are very numerous in the two oceans.

The *Carangus* of the Antilles, (*Scomber carangus*, Bl. 340.)

Is silvery, with a black spot on the operculum, and often weighs from twenty to twenty-five pounds. It is a good wholesome fish.

A species very similar, but without a black spot,

The *Bastard Carangus*. (*Guaratereba*, Séb. iii. 27. 3.)

Is, on the contrary, very often poisonous [2].

One might also distinguish the carangi without teeth [3]; and the carangi with very long points at the second dorsal and the anal, that I had named CITULÆ [1].

---

[1] *Scomber dentex*, Bl. Schn.; *Caranx lune*, Geoffr. Saint. Hil., Egypte, Poiss. xxiii. 3, of which *Citula Banksii*, Riss. 2d. ed. vi. 13. and perhaps *Trachurus imperalis*, Rafin. Car. xi. 1. are at least very nearly allied.

[2] Add. the *Scomber hippos* of Linn. which is the *Sc. chrysos* of Mitchill; *Ekalah parah*, Russell 146, perhaps the *Scomber ignobilis*, Forsk.; *Car. sex-fasciatus*, Quoy and Gaym. Zool. de Freycin, pl. lxv. f. 4; *Jarra dandrée parah*, Russell 147; *Scomber Kleinii*, Bl. 347. 2; *Sc. sansun*, Forsk.; *Kuguroo-parah*, Russ. 145; *Talan-parah*, id. 150, or *Scomber Malabaricus*, Bl., Schn.; *Wootin-parah*, Russ. 148.

[3] *Scomber speciosus*, Lacép. iii. 1. 1. or *Polooso-parah*, Russ. 149, of which the *Car. petaurista*, Geoffr. Eg. xxiii. 1. appears an adult.

We thus pass, by degrees, to fishes which may be united under the common name of

VOMER,

And which are more and more compressed and raised, in which the armature of the lateral line is successively weakened, whose skin becomes fine, satiny, and without apparent scales, which have only small, even teeth, and which are distinguished among themselves by the different elongations of some of their fins.

Linnæus and Bloch ranged them in the genus ZEUS, but with little propriety. We divide them as follows:

OLISTUS, *Cuv.*

Differ from the citulæ, inasmuch as the middle rays of their second dorsal are not branched, but only articulated, and that they are prolonged into long filaments [2].

SCYRIS, *Cuv.*

Have the same filaments, and pretty nearly the same form, but the spines which should form their first dorsal are entirely concealed in the edge of the second; the ventrals are short [3].

---

[1] *Tchawil-parah,* Russell 151 ; *Mais-parah,* id. 152.

[2] The species is new.

[3] The *Gal d'Alexandrie,* Geoff., Eg., Poiss. xxii. 2.

BLEPHARIS, *Cuv.*

Have long filaments to their second dorsal and to their anal. Their ventrals are very much prolonged, and the spines of the first are short, and scarcely pierce the skin[1]; their body is raised; their profile has only the ordinary degree of inclination.

GALLUS, *Cuv.*

The profile more vertical than in blepharis, but all the other characters similar[2].

ARGYREIOSUS, *Cuv.*

The profile still more elevated; the first dorsal decidedly marked, and some of its rays prolonged into filaments, like those of the second; their ventrals are also much more lengthened[3].

VOMER, properly so called.

The body is compressed, and the profile vertical, as in gallus and argyreiosus, but there is no prolongation to any of the fins[1]. The genus

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[1] *Zeus ciliaris*, Bl. 196. *Zeus sutor*, Cuv., the *Cordonnier* of Martinique.

[2] *Zeus gallus*, L., Bl., or *Gurrah-parah*, Russ. 57. *Chewoola-parah*, Id. 58.

[3] *Zeus vomer*, Mus., Ad. Fred. xxxi. 9. and better, Bl. 93. 2. or *Abacatuia*, Marcgr. 161. *Zeus rostratus*, Mitch. op. cit. ii. 1. N. B. The *Zeus niger*, Bl., Schn., is founded on a mistake; a figure of the *Abacatuia*, in the work of Marcgrave, p. 145, having been placed next to the description of the *Guaperva*, or *Chætodon arcuatus*. The *Sélène argentée*, Lacép. IV. ix. 2. is an *Abacatuia*, whose first dorsal and ventrals had been worn. His *Sélène quadrangulaire*, is the *Chæt. faber*.

Zeus, *Lin.*

After abstracting the galli and argyreiosi, &c., comprehends fishes with a compressed body, an extremely protractile mouth, like that of the menides, and having but few and weak teeth. They require, however, to be greatly subdivided.

Zeus, *Cuv.*

Dorsal emarginated, its spines accompanied by long slips of membrane; a series of bifurcated spines along the base of the dorsal and the anal.

Z. faber, L., Bl. 41. (the common dory.) Yellowish, with a round black spot upon the flank: an excellent fish, that is sometimes called the *fish of St. Peter.*

Z. pungio, Cuv., Rond. 328, is another species distinguished by a stout bifurcated spine on the shoulder. From the Mediterranean.

Capros, *Lacép.*

The emarginated dorsal of the dories, and a mouth still more protractile, but no spines along the dorsal and anal; the entire body covered with very rough scales.

But one species is known, *Zeus aper*, which is small and yellowish. It inhabits the Mediterranean[2].

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[1] *Zeus setapinnis*, Mitch. op. cit. i. 9. Labat. Voy. de Desmarchais, i. p. 312.

[2] It is also the *Perca pusilla* of Brunnich.

LAMPRIS, *Retzius.* *Chrysotosus,* Lac.

Has but a single dorsal, highly elevated before, as is the case with the anal; and which has but one small spine at the base of its anterior edge. There are ten very long rays to each ventral; the lobes of their caudal are also very long, but all these prolongations become worn away with age; sides of the tail carinated.

But one species is known, from the northern seas, (*Lampris guttatus,* Retz.)[1]; it attains a large size, is of a violet colour, spotted with white, and has the fins red.

EQUULA, *Cuv.*

A single dorsal, but with several small spines, the anterior of which are sometimes very long; the snout highly protractile; body compressed; edges of the back and belly dentated along the fins. They are small fishes, several species of which inhabit the Indian Ocean[2].

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[1] It is the *Zeus regius,* Bonnat. Encycl. Icthyol. f. 155; the *Z. imperialis,* Shaw, Nat. Misc., No. 140; the *Z. luna,* Gmel.; the *Z. guttatus,* Brunnich, Soc. des. Sc. de Copenh. iii. 388; the *Scomber pelagicus,* Gunner. Mém, de Dronth., IV. xii. 1; the *Chrysotose lune,* Lacép. IV. ix. 3; the *Moon-fish,* Duham., Sect. iv. pl. vi. f. 5; the *Opah* of Pennant, &c.

[2] The type of this genus is the *Scomber equula* of Forskal, of which Gmelin has made his *Centrogaster equula,* and Lacép. his *Cæsio poulain.* Add *Eq. ensifera,* Cuv., or *Scomber edentulus,* Bl. 428, or *Leyognathe argenté,* Lacép. *Eq. cara,* Cuv., Russ. 66. *Eq. fasciata,* Cuv., or *Clupea fasciata,* Lacép. v. p. 463. Mém. du Mus.

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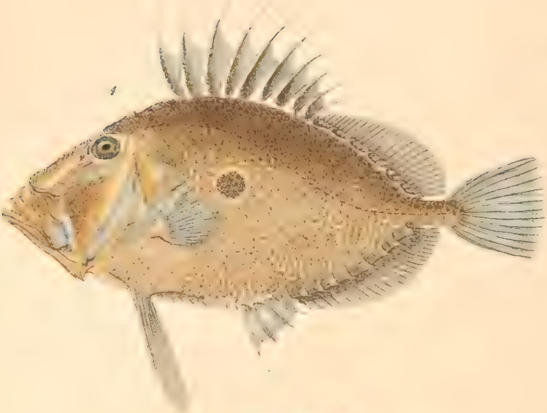

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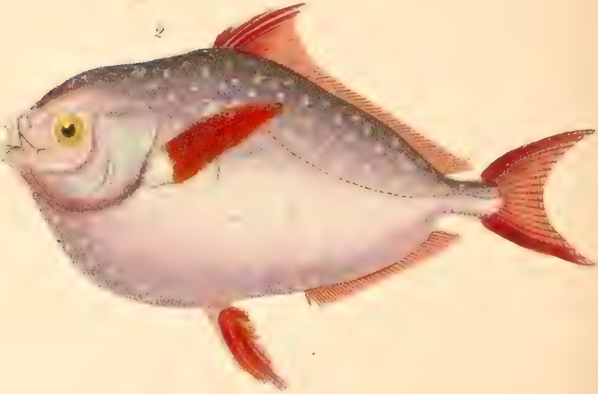

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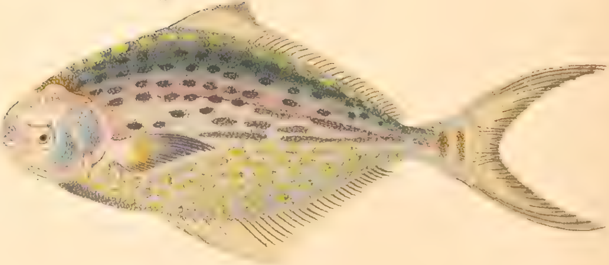

1 *Zeus faber*

2 *Lampris guttatus*

3 *Stromateus fiatola*

[illegible]

The snout of some of these species when in a state of quiescence is singularly retracted; by suddenly protruding it they are enabled to seize upon such small fishes or insects as may pass within reach[1].

MENE, *Lacép.*

Snout of an equula, and the body still more compressed; abdomen trenchant, and very convex beneath, a circumstance resulting from the development of the bones of the shoulder and pelvis, while the dorsal line is almost straight, which throws the ventrals behind the pectorals.

But one species is known, the *Mené Anne-Caroline,* Lacép. V. xiv. 2., or the *Zeus maculatus,* Bl. Schn. pl. xxii. Russell 60. It is of a fine silver colour, spotted with blackish near the back. From the Indian Ocean.

STROMATEUS, *Lin.*

The same compressed form as in the different species of zeus, and similar diminutive and slightly apparent scales, under a satiny epidermis; but the snout is obtuse and non-protractile; a single dorsal, whose few spines are concealed in its anterior edge; no ventrals. The vertical fins are sufficiently thick to tempt us to

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I. xxiii. 2. *Eq. splendens*, Cuv., Russ. 61. *Eq. daura*, Cuv., Russ. 65. *Eq. totta*, Russ. 62. *Eq. coma*, Russ. et Seb. III. xxvii. 4. 63. *Eq. ruconius*, Buchan. xii. 35. *Eq. minuta*, Cuv., or *Scomber minutus*, Bl. 429. 2. which may very possibly be the same as the *Zeus argentarius*, Forster ix. Schn. 96.

[1] *Eq. insidiatrix*, Cuv., or *Zeus insidiator*, Bl. 192. f. 2. and 3.

approximate them also to the squamipennes. Independently of the ordinary lateral line, there is a stria on the flank, which has been considered as a second one. The œsophagus is armed with a number of spines, which are attached to the velvety coat by radiating roots.

S. fiatola, Lin., Belon. aquat. 153, Rondel. 493[1]. A pretty, oblong species, inhabiting the Mediterranean, remarkable for spots, and interrupted bands of a golden tint, on a lead-coloured ground.

S. stellatus, Cuv., from the coast of Peru, is nearly similar in form, but is sprinkled with black spots. It is common in the markets of Lima.

Several other species inhabit the Indian Ocean, called by the French colonists *Pamples*. They are generally more elevated than the fiatola, and spines or trenchant blades are frequently found before their dorsal, and even before their anal[2]. We may distinguish from among them

PEPRILUS, *Cuv.*

Where the pelvis forms a trenchant and pointed blade before the anus, that might be taken for a vestige of ventrals[1]. Besides this, there are the trenchant blades, of which we have just spoken: and there is even one species in which these blades are notched[2].

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[1] This figure, in which the left pectoral is bent downwards, being mistaken by Lacép. for a ventral, gave rise to his genus *Chrysostromus*, which must consequently be suppressed.

[2] 1 The *Stromateus niger*, Bl. 422, and better 160, under the false name of *Str. paru*, Russ. 43. 2 The *Str. albus*, Cuv., Russ. 44. 3 *Str. candidus*, Cuv., Russ. 42. *Str. argenteus*, Euphrasen, Nouv. Mém. de Stockh. IX. pl. ix. or *Str. aculeatus*, Bl. Schn. *Str. griseus*, Cuv.

LUVARUS, *Rafin.*

Apparently closely approaches peprilus: the extremity of the pelvis is furnished with a small scale that acts as an operculum to the anus; no trenchant blades; a prominent carina on each side of the tail, as in the tunny, &c.

Luv. imperialis, Rafin. Ind. d'Ittiol. Sicil. pl. i. f. 1. Silvery, with a reddish back. An extremely large species that inhabits the seas of Europe[3].

SESERINUS, *Cuv.*

Have all the characters of stromateus, even internally; but they exhibit two very small ventrals, or rather two vestiges of ventrals.

There is a small species from the Mediterranean, (*Seserinus Rondeletii,* Cuv.), Rondel. 257.

KURTUS.

Closely allied to *Peprilus,* from which they principally differ, because their dorsal is less extended in length, and because their ventrals are well developed; their anal is long; their scales are so fine that they are scarcely perceivable but when the skin is dried; there are none on the fins; there are seven rays to their gills; their pelvis has a spine between the ventrals, and there are some small trenchant laminæ in front of the dorsal, whose base has a spine directed horizontally.

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[1] *Chætodon alepidotus*, L., or *Stromateus, longipennis*, Mitch. *Str. cryptosus*, Mitch. *Str. paru*, Sloane, Jam. ii. pl. ccl. f. A.

[2] *Peprilus crenulatus*, Cuv., a small and new species.

[3] A specimen was taken at the isle of Ré, in 1826, a drawing of which was forwarded to us by M. Journal Rouquet.—We suspect that we should refer to it, at least as a congener, the *Ausonia Cuvieri*, Risso, 2d ed. pl. xi. f. 28. which is figured, however, with two anal spines.

Their skeleton presents one great singularity; the ribs are dilated, convex, and form rings which are in contact with each other, thus enclosing a conical and empty space, which extends beneath the tail in the inferior rings of the vertebræ, in a long and thin tube which contains the natatory bladder. The *Kurtus Indicus,* Bl. 169. is very probably the female of the *Kurtus cornutus,* or *Somdrum-Kara-Mottee* of Russell, a fish very remarkable for a little cartilaginous and curved horn, which rises from the first of the small trenchant blades before the dorsal.

CORYPHÆNA, *Lin.*, Vulg. *Dorado.*

The body compressed, elongated, covered with small scales; upper part of the head trenchant; a dorsal extending the whole of the back, composed of rays almost equally flexible, although there is no articulation to the anterior ones; seven rays in the gills.

CORYPHÆNÆ (proper), *Cuv.*,

Have the head very much elevated, the profile curved

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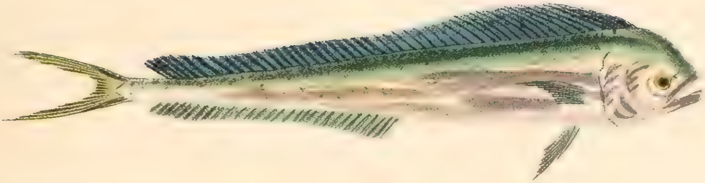

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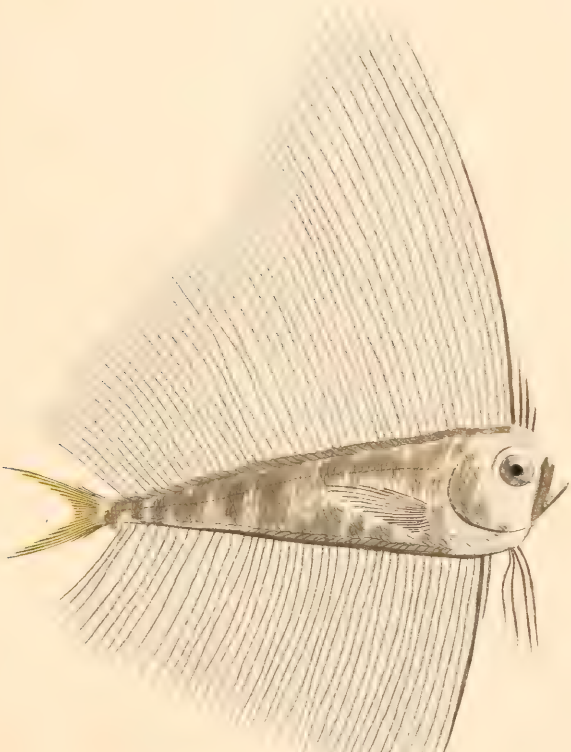

1 *Coryphæna azorica*

2 *Pteraclis trachypterus*

London Published by [illegible] March [illegible]

into an arch, falling very rapidly; the eyes very much depressed, and teeth to the palatines as well as to the jaws. These are large and fine fishes, celebrated among navigators for the rapidity of their swimming, and the war which they carry on with the flying fish. *C. hippurus*, L.; sixty rays to the dorsal; of a silvery blue above, with spots of deep blue, citron yellow, spotted with clear blue underneath.

There are several approximating species in the ocean confounded with this last[1]

CARANXOMORUS, *Lacép.*,

Differ from the coryphænæ proper, because their head is oblong and but little elevated, and their eye in a medial position[2].

CENTROLOPHUS, *Lacép.*,

The palatine teeth are wanting; there is an interval without rays between the occiput and the commencement of the dorsal[3].

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[1] We will describe several of them in our Ichthyology, and endeavour to settle their synonymes.

[2] *Scomber pelagicus*, L., Mus. Ad. Fred. xxx. f. 3. or *Cychla pelagica*, Bl., Schn. *Cor. fasciolata*, Pall. Spic., Zool., Fasc. viii. pl. iii. f. 2.

[3] *Coryphæna pompilus*, L., Rondel. 250. The *Centrolophe nègre*, Lacép. iv. 441. the same as the *Perca nigra*, Gmel. Borlasse, Hist. of Cornw. pl. xxvi. f. 8. or *Holocentre noir*, Lacép. The *Merle* Duham., Sect. iv. pl. vi. f. 2.

ASTRODERMUS, *Bonnelli.*

The elevated and trenchant head, and long dorsal of the coryphænæ, but the mouth is slightly cleft; there are but four rays in the branchiæ, and their ventrals are very small and placed on the throat; the scales scattered over the body assume the radiated form of small stars.

Astrod. guttatus, Bonn., *Diana semilunata,* Risso., Ed. ii. pl. vii. f. 14. Silvery, spotted with black, red fins, and a very high dorsal. From the Mediterranean; no other species known [1].

PTERACLIS, *Gronov.* OLIGOPODUS, *Lacép.*

Teeth and head of the coryphænæ, but the scales are larger, the ventrals jugular and very small, and the dorsal and anal as high as the fish itself.

P. velifer, Coryphæna velifera, Pall. Spic. Zool., Fasc. viii. pl. i. From the Carolinas, and the only species known [2].

The eighth family of the Acanthopterygii, that of

TÆNIOIDES, or *Riband-fish,*

Is very nearly allied to scomberoides, and its first genus is even intimately connected with Gempilus and Thyrsites; the fishes which compose it are elongated, flattened on the sides, and have very small scales.

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[1] *Astrodermus guttatus,* Bonnelli, or *Diana semilunata,* Riss. 2d ed. vii. f. 14.

[2] Bosc assures us that he caught it in Carolina; Pallas says that his is from the Moluccas. They may be different species.

In the first tribe we find the muzzle elongated, the mouth cleft, and armed with strong, pointed, and trenchant teeth, and the lower jaw advancing beyond the upper one: it comprises but two genera.

LEPIDOPUS, *Gouan.*,

Whose special character consists in the reduction of the ventrals to two small scaly plates; the thin and elongated body is furnished with a dorsal above, which extends throughout its length, with a low anal beneath, and terminates in a well formed caudal; there are eight rays in the branchiæ; the stomach is elongated, with upwards of twenty cœca near the pylorus, and a well marked glandular body is attached to the natatory bladder, which is long and slender.

Lep. argyreus, Cuv. Frequently five feet in length; it has been described under several names[1], and is found from England to the Cape of Good Hope, but is rare every where.

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[1] It is the *Lepidopus* of Gouan., Hist. Pisc. pl. i. fig. 4; the *Trichiurus caudatus*, Euphrasen, Nouv. Mém. de Stockh. IX. pl. ix. f. 2; the *Trich. gladius*, Holten, Soc. Hist. Nat. Copenh. v. p. 23. and pl. ii.; the *Trich. ensiformis* of Vandelli, or *Vandellius lusitanicus* of Shaw; the *Ziphotheca tetradens* of Montagu, Werner, Soc. i. p. 81. pl. ii.; the *Scarcina argyrea*, Rafin. Nuov. Caratt. pl. vii. f. 1; the *Lepidope peron*, Risso; and the *Lepidope argenté* of Nardo.

TRICHIURUS, *Lin.* LEPTURUS, *Artedi.* GYMNOGASTER. *Gronov.*

The same form of body, muzzle, and jaws, as in Lepidopus; similar pointed and trenchant teeth, and a dorsal extending along the back, but the ventrals and caudal are wanting, and the tail is drawn out into a long, slender, and compressed filament. In lieu of the anal there is merely a suite of small and hardly perceptible spines on the under edge of the tail; the branchiæ have but seven rays. They resemble beautiful silver ribands; the stomach is elongated and thick; the intestines straight; the cœca numerous, and their natatory bladder long and simple.

Trich. lepturus, Lin., Brown, Jam. pl. xiv. f. 4[1]. is found in the Atlantic, both on the coast of America and that of Africa.

Two other species are known from the Indian Ocean, one of which, *Trich. haumela,* Schn., *Clupea haumela,* Forskal, and Gm. *Savala,* Russell i. 41. is very similar to the lepturus, being only somewhat shorter. The other, *Trich. savala*, Cuv., is still less elongated, and has a smaller eye[1].

---

[1] It is the *Ubirre*, of Laet., Ind. Occid. 573, which, through a mistake, pointed out by himself, he has placed in Marcgr. p. 161, as belonging to the description of the *Mucu*, which is a Muræna; this mistake has produced such confusion, that Bloch and others were led to believe that the trichiurus is a fresh-water fish.

A second tribe comprehends genera in which the mouth is small, and but slightly cleft.

GYMNETRUS, *Bloch.*

The body elongated and flat, as in all the preceding divisions, and totally deprived of the anal fin; but there is a long dorsal, whose lengthened anterior rays form a sort of plume, but they are easily broken; the ventrals, when not worn or broken, are very long, and the caudal, composed of very few rays, rises vertically from the extremity of the tail, which ends in a small hook. There are six rays in the gills; the mouth is slightly cleft, very protractile, and furnished with but few and small teeth. Some small spines on the lateral line, which are more salient towards the tail. These fishes are extremely soft, and their rays very fragile. They have been frequently and incorrectly figured from mutilated specimens[2]; their bones, the vertebræ in particular, are but very slightly indurated; their stomach is elongated, and their cœca very numerous; the natatory bladder is wanting, and their mucous flesh is very rapidly decomposed.

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[1] A transposition in the text of Nieuhof has caused electric properties to be attributed to the trichiuri of India, which they most assuredly do not possess.

[2] The *Falx venetorum* of Belon, of which Gouan has made his genus TRACHYPTERUS, and which has become the *Cepola trachyptera*, Gmel., only differs from the *Tænia altera* of Rondel. 327., and even from his *Tænia prima*, which is the *Cepola tænia*, L , and from the *Spada maxima*, Imperati, 517., or *Cepola gladius* of Walbaum, and from the *Tænia falcata*, Aldrov., or *Cepola iris* of Walbaum, in the

Several species are found in the European Seas, which differ in the number of their dorsal rays, and which, when entire, that is when young, frequently present a most singular appearance from the prolongation of their fins.

The most brilliant of the Mediterranean species has but from one hundred and forty to one hundred and fifty dorsal rays; it has only been seen small, or of a moderate size. Another has from a hundred and seventy to a hundred and seventy-five, specimens of which are found in cabinets, from four to five feet in length. A third has more than two hundred of these rays, and is more than seven feet in length.

The Arctic Ocean produces two species, called in

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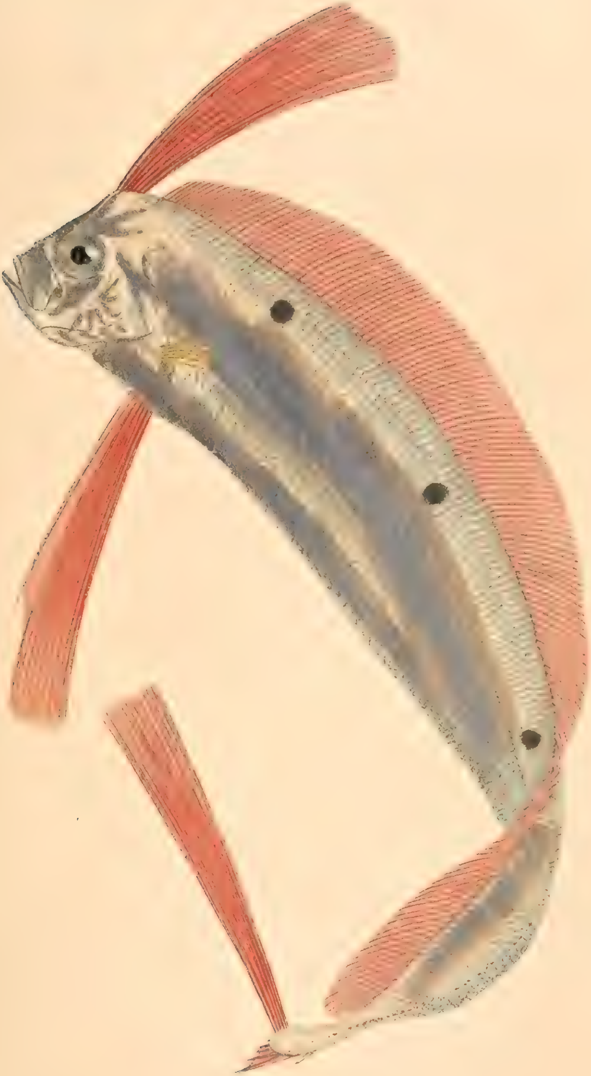
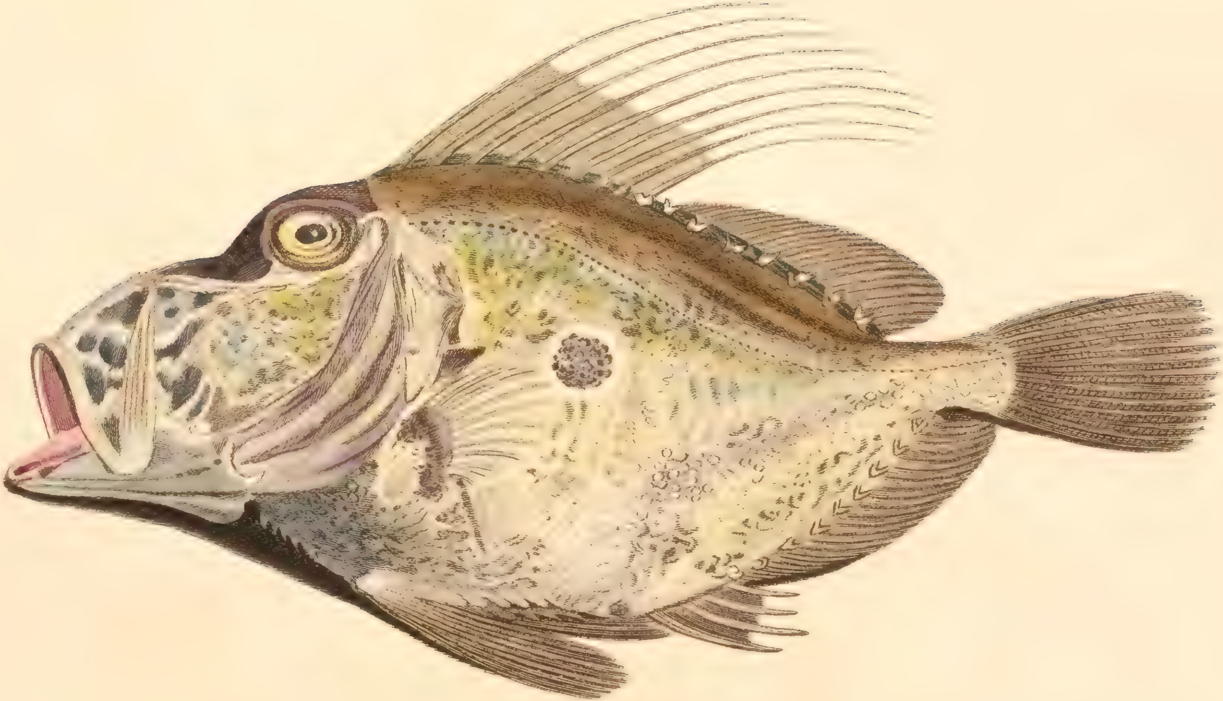
various degrees of individual mutilation. It is the same with respect to the *Vogmar* of the Icelanders of Olafsan and Powelsen, Isl., tr. fr. pl. li., or *Gymnogaster arcticus* of Brünnich, Soc. Scient. Copenh. iii. pl. xiii., which is the genus BOGMARUS, Bl. Schn.; with respect to the *Gymnètre cépédien*, Risso. 1st. Ed. pl. v. f. 17.; to the *Argyctius quadrimaculatus*, Rafin. Caratt. i. f. 3., to his *Scarcina quadrimaculata* and *imperialis*; to the *Gymnetrus Mediterraneus* of Otto; to the *Epidesmus maculatus* of Ranzani, Opusc. Scientif. Fascic. viii., and to the *Regalecus maculatus* of Nardo, Phys. Journ., Pavia viii. pl. i. f. 1. All these fishes hardly differ in species, and not in the least as to genus. Bonnelli's specimen was the least mutilated: he calls it *Trachypterus cristatus*, Acad. Turin xxiv. pl. ix.



Gymnetrus falx



Norway, the king of the herrings[1]; one of which is said by some to have one hundred and twenty rays, and by others one hundred and sixty, and to attain the length of ten feet; the other has more than four hundred rays, and is eighteen feet in length[2]. The ventrals consist of a long filament dilated near the extremity. They are also found in India[3].

STYLEPHORUS, *Shaw.*

A vertical caudal, as in Gymnetrus, but shorter; the extremity of the tail instead of being curved into a small hook, is prolonged into a slender cord longer than the body.

S. chordatus, Shaw, Lin. Trans. I. vi. Nat. Misc. vii. pl. cclxxiv. and Gen. Zool. iv. part i. pl. ii. A badly preserved specimen, and the only one known. It was taken in the Gulf of Mexico, and for a long time we had only the above mutilated drawing of it. M. de Blainville, however, has given us a more regular figure. Journ. de Phys. tome lxxxvii. pl. i. f. 1. which exhibits no ventrals.

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[1] It is the *Regalecus glesne*, Ascanius, Ic., Fasc. ii. pl. xi., which he afterwards named *Ophidium glesne*, Mem. Soc. Scient. Copenh. iii. p. 419., or the *Regalicus remipes*, Brünnich, ib. pl. B. f. 4. and 5. Bloch, Syst. pl. lxxxviii., copies and alters the figure of Ascanius. A better copy is Encycl. Method. f. 358.

[2] *Gymnetrus Grillii*, Lindroth, Nouv. Mém. de Stockh. xix. pl. viii.

[3] *Gymnetrus Russelii*, Shaw iv. part ii. page 195. pl. xxviii.

Add the *Gymnetrus Hawkenii*, if the figure be correct; but the *Régalec lancéolé*, or *Ophidie chinoise*, Lacép. I. xxii. 3., or the *Gymnetrus cepedianus*, Shaw, does not belong to this genus.

In a third tribe the snout is short, and the mouth cleft obliquely.

CEPOLA, *Lin.*[1]

A long dorsal and anal, both reaching to the base of the caudal, which is tolerably large; no rise in the cranium; snout very short; lower jaw curved upwards; the teeth prominent, and the ventrals sufficiently developed. There are but two or three non-articulated rays in the dorsal, which are as flexible as the others; the spine of the ventrals is alone stiff and sharp; there are six rays in the gills, and the abdominal cavity is very short as well as the stomach; there are some cœca and a natatory bladder, which extends into the base of the tail.

Cep. rubescens, L., Lin. Trans. VII. xvii. and Bloch. 170, under the false name of *Cep. tænia*[2], a Mediterranean species of a red colour.

LOPHOTES, *Giorna.*

A short head, surmounted by a high osseous crest to the summit of which a long and stout spine is articulated, bordered behind with a membrane, while a low fin, whose rays are nearly all simple, extends from this spine to the point of the tail, which has a distinct, but very small caudal; an extremely short anal lies beneath that point; moderate pectorals, beneath which are scarcely perceptible ventrals, composed of four or five excessively small rays; the teeth are pointed and not crowded; the mouth is directed upwards, and the eye very large; there are six rays in the gills, and the abdominal cavity occupies nearly the whole length of the body.

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[1] This name of CEPOLA, given by Willughby as a Roman synonyme of the *Fierasfer*, has been applied by Linn. to the present genus, to which the *Fierasfer* does not belong.

[2] Add the *Cepola japonica*, Krusenst. Voy. pl. lx. f. 1.

L. cepedianus, Giorna. Mem. of the Imp. Acad. of Turin. 1805. 1808, p. 19. pl. ii. The only species known; it is found, though rarely, in the Mediterranean, and becomes very large[1].

The ninth family of ACANTHOPTERYGII, or that of

THEUTYES,

Is as closely allied to the scomberoïdes as the preceding, but in other points; such as the armature which is found in several genera on the sides of the tail, or in others, the recumbent spine before the dorsal, &c. It contains but very few genera; they are all foreign, and have a compressed, oblong body, a small mouth, but slightly, or not at all protractile, each jaw of which is armed with a single range of trenchant teeth; palate and tongue without teeth, and a single dorsal. They are herbivorous, feeding on fucus and other marine plants; their intestines are very large.

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[1] The description of Giorna is imperfect, because he only had a mutilated specimen, of whose origin he was ignorant. I drew mine from an individual more than four feet in length, taken at Genoa. See An. Mus. XX. xvii.

SIGANUS, *Forsk.* BURO, *Commer.* CENTROGASTER, *Hout.* AMPHACANTHUS, *Bloch.*

These fishes have a remarkable character, unique in ichthyology, in their ventrals, which are furnished with two spinous rays, one external, the other internal; the three intermediate ones branching as usual. They have five branchial rays and a recumbent spine before the dorsal. The styloid bones of their shoulder curve as they lengthen, so as to unite at their extremities with the first interspinal of the anal[1].

Numerous species are found in the Indian Ocean[2].

ACANTHURUS, *Lacép.* and *Bl.* HARPURUS, *Forst.*

Teeth trenchant and notched; a strong moveable

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[1] Geoffr., Phil. Anat. i. 471., and pl. ix. f. 108.

[2] *Theutis javus*, L., Gronov., Zoophyl. pl. viii. f. 4. *Siganus stellatus*, Forsk. *Amphac. punctatus*, Bl. Schn., or *Acanthurus meleagris*, Shaw. *Buro brunneus*, Commers., Lacép. v. 421. *Siganus rivulatus*, Forsk. *Amphac nebulosus*, Quoy and Gaym., Zool. Voy. Freycin. p. 369. *Centrogaster fuscescens*, Houttuyn. *Chætodon guttatus*, Bl. 196. *Amph. marmoratus*, Quoy and Gaym., Voy. Freycin., Zool. pl. lxii. f. 1. and 2. *Amph. magniahac*, ib. f. 3. *Centrogaster argentatus*, Houtt., and several others to be described in our Ichthyology.

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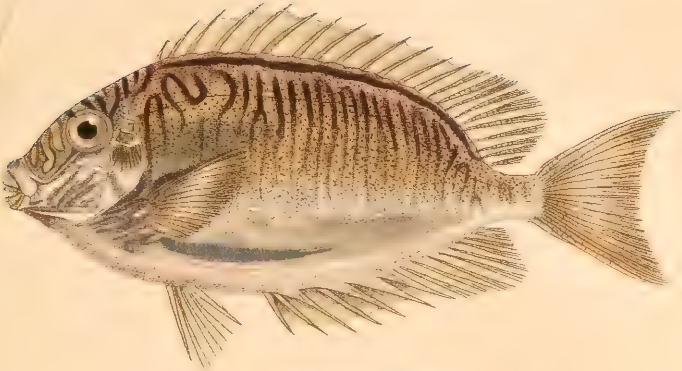

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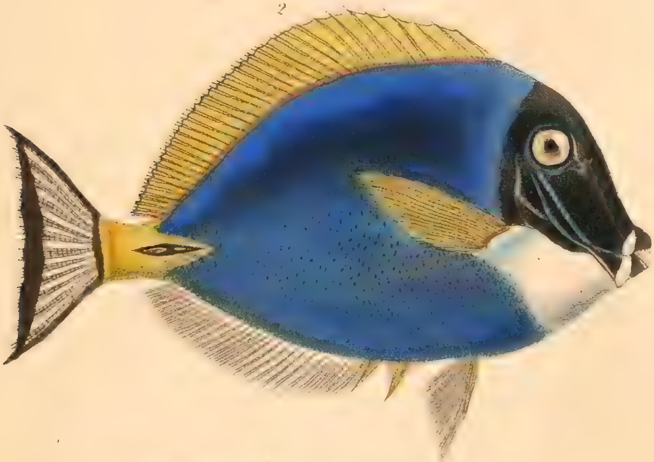

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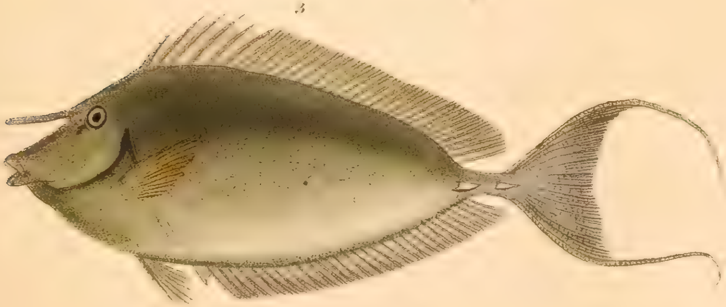

1 *Siganus deliatus.*

2 *Acanthurus Delisianus.*

3 *Naseus longicornis.*

[illegible]

spine on each side of the tail, that is as sharp as a lancet, and inflicts severe wounds on those who carelessly handle these fishes; hence their vulgar name of *Surgeons*. They inhabit the hot parts of both oceans[1].

The dorsal of some species is very high[2].

Some have a sort of brush, composed of stiff hairs, before the lateral spine[3].

In others, again, the teeth are deeply notched, or pectinated on one side[4].

PRIONURUS, *Lacép.*,

Only differs from the preceding genus in the armature of the sides of the tail, which consists of a suite of fixed, horizontal, and trenchant laminæ[5].

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[1] *Chætodon chirurgus*, Bl. 208. *Theutis hepatus*, L., Seb. III. xxxiii. f. 3. *Ac. glauco-pareius*, Cuv., Seb. III. xxv. 3., which appears to be the true *Chætodon nigricans*, L. *Chæt. triostegus*, Brousson., Dec. Icht. No. 4., or *Acanthure zèbre*, Lacép., which is also his *Chæt. zèbre*, III. xxv. 3. *Ac. guttatus*, Bl. Schn. *Ac. suillus*, Cuv., Renard, i. pl. xiv. f. 82. *Chæt. lineatus*, L., Seb. III. xxv. 1. *Chæt. Achilles*, Broussonnet. *Chæt. meta*, Russ. 82. *Chæt. sohal*, Forsk. of which Lacép. has very improperly made a genus under the name of *Apisurus*. *Ac. striatus*, Cuv., *Paningu*, Renard, pl. i. f. 8. *Ac. argenté*, Quoy and Gaym. Voy. Freycin. p. 63. f. 3. *Chæt. nigrofuscus*, Forsk. *Chæt. nigricans*, Bl. 203. which is not that of Linnæus.

[2] *Ac. velifer*, Bl. 427.

[3] *Ac. scopas*, Cuv., Renard, i. pl. xi. 101.

[4] *Ac. ctenodon*, Cuv., a new species.

[5] *Prionure microlépidote*, Lacép. An. Mus. iv. p. 205. *Acanthurus, scalprum*, Langsdorf.

Naseus, *Commer.* Monoceros., *Bl.*, *Schn.*

Sides of the tail armed with fixed trenchant laminæ, but the teeth are conical, and the front advances in a kind of horn, or knob, above the muzzle. There are but four rays in the gills, and three soft rays in the ventral fins; the skin bears a similitude to leather[1].

Axinurus, *Cuv.*,

More elongated, and without horn or knob, but with the same branchial and ventral rays as in the preceding genus; each side of the tail armed with a single square trenchant blade without a shield; the mouth very small, and the teeth very slender[2].

Priodon, *Cuv.*

The notched teeth of Acanthurus, the three soft ventral rays of Naseus, and the unarmed tail of Siganus[3].

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[1] *Naseus fronticornis* Cuv., Lacép. III. vii. 2. Bl., Schn., pl. lxii. Hasselq. it. pal. 332. *Nas. tandock*, Ren. I. iv. 23. Valent. 518. *Chæt. unicornis*, Forsk., differ from our first species. *Nas. brevirostris*, Cuv., Ren. I. xxiv. 130. *Nas. tumifrons*, Cuv., badly drawn, Ren. i. 178. *Nas. incornis*, Cuv., Ren. i. f. 128. and not so well, f. 147. probably the *Acanthurus harpuras*, Shaw. *Nas. carolinarum*, Quoy and Gaym. op. cit. pl. lxiii. f. 1. *Nas. tuber*, Commers., or *Nason-Loupe*, Lacép. III. vii. 3. or *Acanthurus nasus*, Shaw, Renard i. f. 79. Valent. 119 and 478.

[2] *Axinurus thynnoides*, Cuv., a new species brought by Quoy and Gaymard from Golden Harbour, New Guinea.

[3] *Priodon annularis*, Cuv., a new species brought from Timor by the same gentlemen.

The tenth family of the ACANTHOPTERYGII comprehends a small number of genera, distinguished by

LABYRINTHIFORM PHARYNGEALS.

That is to say, that a part of the superior pharyngeals of these fishes is divided into small laminæ, more or less numerous, intercepting cells, in which water can remain, flow upon, and moisten the gills when the fish is on dry land. Thus these fishes are permitted to repair to land, and crawl to a very considerable distance from the rivulets or pools which constitute their ordinary habitation; a singular faculty, not unknown to the ancients[1]. This also induces the people of India to believe that these fishes fall from heaven.

ANABAS, *Cuv.*,

Are such as have these labyrinths in the greatest degree of complication; nevertheless the third pharyngeals have teeth disposed like pavement *(en pavés)*, and there are others behind the cranium. Their body is round, and covered with strong scales, their head broad, muzzle short and obtuse, and mouth small; the lateral line is interrupted at its posterior third. The borders of their operculum, suboperculum, and interoperculum strongly denticulated, but not that of the preoperculum. There are five rays in the gills, and many spinous ones in the dorsal, and even in the anal. The stomach is moderate and rounded, and the pylorus has but three appendages. But one species is known,

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[1] Theophrastus, in his treatise upon fishes which live out of water, speaks of small ones which leave their native streams for some time and then return to them, and says that they resemble a mullet.

An. testudineus, Cuv.[1], called, in the Tamoule tongue, *Paneiri* or *Tree-climber,* highly celebrated, because it not only leaves the water, but, according to Daldorf, even climbs up the shrubs on its banks; this latter assertion, however, is disputed. Found throughout all India.

POLYACANTHUS, *Kuhl.*

Rays spinous; as numerous as in Anabas, and more so; the same mouth, scales, and interrupted lateral line; but neither of the opercula is denticulated; the body is compressed, and there are four rays in the gills; a narrow band of small, short, and crowded teeth in the jaws, but none in the palate; the branchial apparatus is more simple, and their pylorus has but two cœcal appendages.

Found in rivers, &c. throughout all India[2].

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[1] It is the *Amphiprion scansor,* Bl., Schn. p. 204 and 570, or *Perca scandens,* Daldorf. Lin. Trans. iii. p. 62. It is also the *Anthias testudineus,* Bl. pl. cccxxii. and the *Coius coboius,* Ham. Buchan. pl. xiii. f. 38.

[2] *Trichopodus colisa,* H. Buchan. *Trich. bejeus,* Id. 118. *Trich. cotra,* Id. 119. *Tr. lalius,* Id. 120. *Tr. sola,* Id. ib. *Tr. chuna,* Id. 121. *Trichogaster fasciatus,* Bl., Schn. pl. xxxvi. p. 164. *Chætodon chinensis,* Bl. pl. ccxviii. f. 1.

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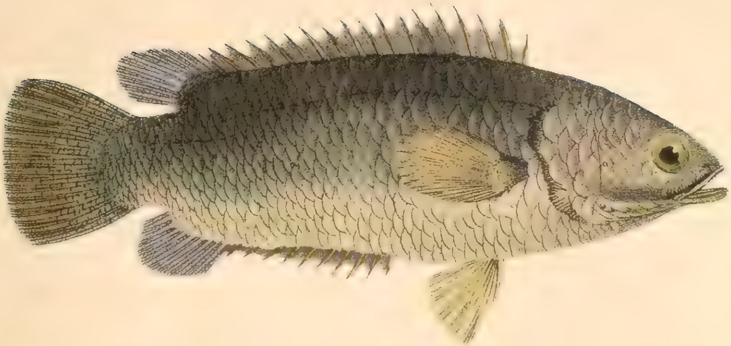

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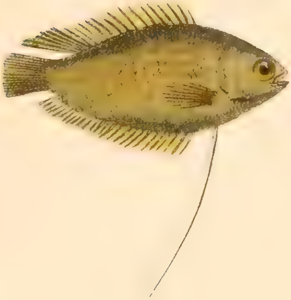

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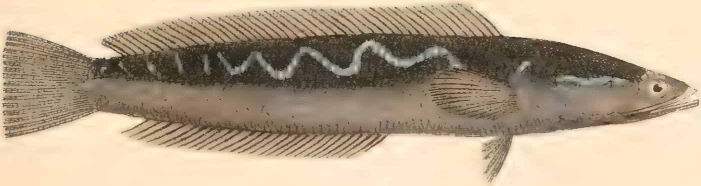

1. *Anabas testudineus.*

2 *Polyacanthus colisa*

3 *Ophicephalus serpentinus*

London Published by Whittaker & C. Ave Maria Lane 1834.

Macropodus, *Lacép.*,

Only differs from Polyacanthus in a less extended dorsal, which terminates, as well as the caudal and the ventrals, in a slender point, more or less elongated. The anal is larger than the dorsal.

Fresh-water fishes found in India and China[1].

Helostoma, *Kuhl.*

In addition to the characters of Polyacanthus, fish of this genus have a small compressed mouth, so protractile that it seems to advance from the suborbitals, and to retreat between them; their very small teeth are attached to the borders of the lips, and not to the jaws or palate; there are five rays to the gills. The arches of the branchiæ, on the side next to the mouth, are furnished with lamellæ, nearly similar to the external ones, which may also assist in the process of respiration[2]. Their stomach is small, and has but two pyloric appendages, but their intestine is very long; the parietes of their natatory bladder are thick.

Osphromenus, *Commers.*[3]

All the characters of a Polyacanthus, but the forehead is somewhat concave; the anal larger than the dorsal, as in Macropodus; the suborbitals and lower part of the preoperculum very finely denticulated; the first soft ray of the ventrals extremely long; six branchial rays and the body strongly compressed.

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[1] The *Macropode vert doré*, Lacép. III. xvi. 1. and a new and much more beautiful species with alternate red and green bands.

[2] But one species is known (*Hel. Temminckii*, Cuv.) from the Moluccas, which we shall minutely describe in our Ichthyology.

[3] This name is derived from ὄσφρομαι (*olfacio*), and was invented by Commerson, who conjectured that the hollow pharyngeals visible

A species of this genus originally from China, is *Osphr. olfax*, Commers., the *Gourami*, Lacép. III. iii. 2; it becomes as large as the turbot, and is considered even more delicious. It was introduced into the ponds of the Isle of France, where it increases rapidly, and has been taken thence to Cayenne. The female is said to form a cavity in the sand for the reception of her eggs.

TRICHOPODUS, *Lacép.*,

Differs from Osphromenus in having a more convex forehead, and a shorter dorsal, besides which there are but four rays in the branchiæ. The first soft ray of their ventrals very long.

There is but one species known, a small fish of the Moluccas, marked with a black spot on the side[1].

---

in this fish, as in others of the family, might be organs of smell, a kind of ethmoïd.

N. B. The *Osphromene gal*, Lacép. *Scarus gallus*. Forsk. is a *Julis*, Nob.; but we have two new species of true Osphromeni, *Osphr. notatus*, and *vittatus*, Cuv.

[1] It is the *Labrus trichopterus*, Gmel., Pall., Spic., Fasc. viii. p. 45. The *Trichopterus Pallasii*, Shaw, iv. part ii. p. 392. The *Trichogaster trichopterus*, Bl., Schn., and the *Trichopode trichoptère*, Lacép. N. B. The *Trichopode mentonnier*, Lacgr., or *T. satyrus*, Shaw, Vol. iv. part ii. p. 391. only rests upon a bad figure of Gourami.

Spirobranchus, *Cuv.*

The general form of anabas, but the opercula are not denticulated; the operculum merely terminating in points; a series of palatine teeth.

Sp. capensis, Cuv. A diminutive fresh water fish, from the Cape of Good Hope: the only species known.

Ophicephalus, *Bl.*

Resembles all the preceding genera in most of its characters, and particularly in the cellular conformation of the pharyngeals, which are adapted to retain water. These fishes also creep to a considerable distance from their liquid abodes, but what particularly distinguishes and even separates them from all acanthopterygii is the absence of spines in the fins, the first ray of their ventrals at most excepted, and even that, though simple, is not sharp and stiff. Their body is elongated, and almost cylindrical; their muzzle short and obtuse; their head depressed, and furnished above with scales, or rather polygonal plates, as in anabas, &c. There are five rays in their branchiæ: the dorsal occupies nearly their whole length; the anal is also very long, the caudal rounded, the pectorals and ventrals moderate, and the lateral line uninterrupted. Their stomach is shaped like an obtuse sac; two tolerably long cœca adhere to the pylorus: the abdominal cavity extends above the anal, close to the end of the tail. The jugglers of India exhibit this fish out of water, and even the children amuse themselves by forcing it to crawl upon the ground. In the markets of China the larger species are cut up alive to distribute to the buyers[1]. They may be divided by the number of their dorsal rays.

Some have but thirty odd of these rays[2].

Others forty odd[3].

Some, again, have more than fifty[4].

The MUGILOIDES.

Form the eleventh family of acanthopterygii, composed of the genus

MUGIL, *Lin.*

Which may, in fact, be considered as a distinct family, as they present so many peculiarities in their organization. Their body is almost cylindrical, covered with large scales, and furnished with two separate dorsals, the first of which has but four spinous rays; the ventrals are inserted a little behind the pectorals; there are six rays in the branchiæ; their head is somewhat depressed, and covered with large scales or polygonal plates; their muzzle very short. Their transverse mouth, in consequence of a prominence in the middle of the lower jaw, which corresponds with a depression in the upper one, forms an angle, the teeth being excessively fine, and frequently almost imperceptible. Their pharyngeal bones, highly developed, give an angular form to the opening of the œsophagus, similar to that of the mouth, which only permits fluids or very small matters to pass into the stomach, notwithstanding which this stomach terminates in a sort of fleshy gizzard, analogous to that of birds; they have but few pyloric appendages, but the intestine is long and doubled.

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[1] This is most incontestably the genus alluded to by Theophrastus.

[2] *Ophicephalus punctatus*, Bl., or *Oph. lata*, Buchan. *O. marginatus*, Cuv., or *O. gachua*, Buchan? pl. xxi. f. 21. or *Cora motta*, Russell, ii. pl. clxiv. *O. auranticus*, Buch.

[3] *Ophicephalus striatus*, Bl. 359. or *Muttah*, Russell, pl. clxii. or *O. chena*, Buch.? *O. solá*, Id. *O. sowara*, Russ. 163.

[4] *Ophicephalus marulius*, Buch., which is the *Bostrichoïde œillé*, Lacép. II. xiv. 3. *Oph. barca*, Buch. xxxv. 20., to which the *Bostriche tacheté*, Lacép. iii. p. 143., is at least very closely allied, and several new species to be described in our Ichthyology.

They resort to the mouths of rivers in large troops, and are continually leaping out of the water. The European seas produce several species hitherto very imperfectly ascertained. Their flesh is esteemed[1].

Mugil cephalus, Cuv. (the common mullet). Distinguished from all the other species of Europe by its eyes, which are half covered by two adipose veils, adhering to the anterior and posterior edge of the orbit; by the circumstance that when the mouth is closed the maxillary is completely hidden under the suborbitals, and by the base of the pectoral being surmounted by a long and carinated crest. The nasal openings are separated from each other, and the teeth are tolerably prominent. It is the largest and best of the Mediterranean species. We have seen it on the Atlantic coast of Europe, but its characters are visible in several species of India and of America[1].

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[1] Linnæus and several of his successors have confounded all the European mullets under a single species, their *Mugil cephalus.*

Another species, nearly as large as cephalus, and common to the Mediterranean and the ocean, is the *M. capito*, Cuv., the *Ramado* of Nice. The maxillary visible behind the commissure of the jaws, even when the mouth is closed; much weaker teeth; nasal orifices approximated; the skin of the edge of the orbit not extending to the globe of the eye; the supra-pectoral scale short and obtuse; a black spot at the base of the pectoral fin[2].

Two smaller species, *M. auratus* and *M. saltator*, Risso, approach the capito: the maxillary of the first is hidden under the suborbital, as in the cephalus, but the nasal orifices are approximated as in the capito; the other, with the characters of the capito, has an emarginated suborbital, which allows the end of the

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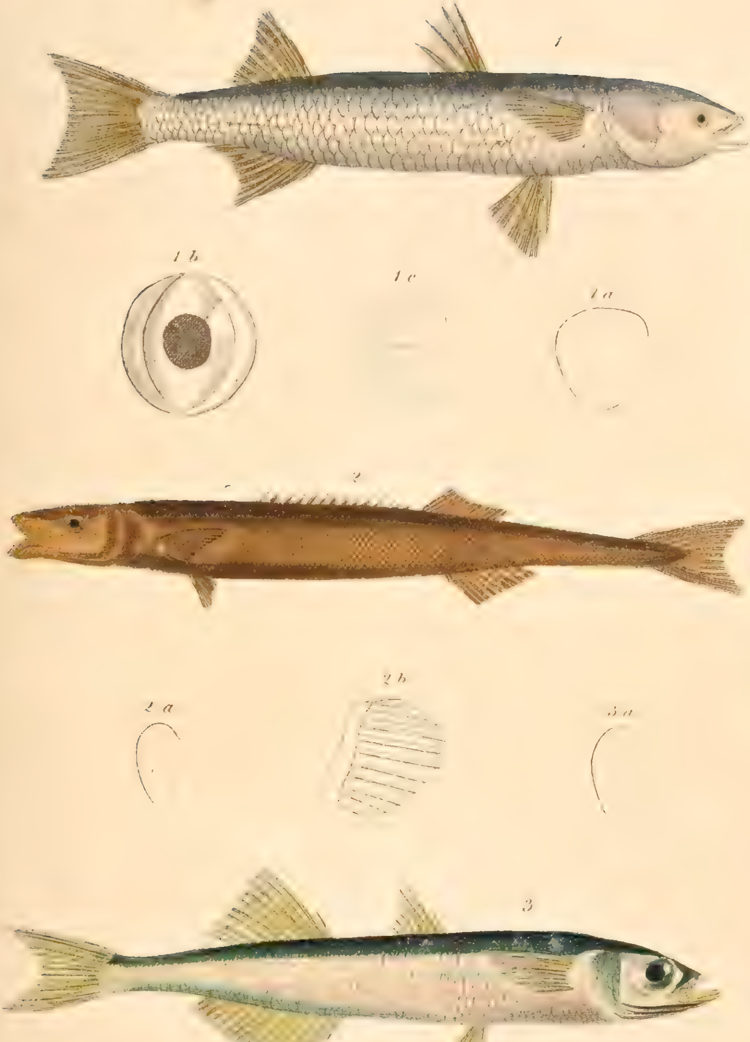
[1] America produces five or six species badly characterized and confounded by Linn., under the name of *M. albula*. Among the number is the *M. Plumieri*, Bl., become a *Sphyræna* in Bl. Schn. p. 110, and the *M. lineatus*, Mitch. The true *cephalus* of the Mediterranean is found on the whole African coast. Add, of species from India, the *Bontah*, Russell ii. 180., or the *M. our.* of Forsk., perhaps the same as our cephalus; the *Kunnesee*, id. 181; *M. corsula*, Buch. pl. ix. 97.

[2] This appears to us to be the species particularly described by Willughby, and figured by Pennant.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1 *Mugil cephale.*

2 *Tetragonurus Cuvieri*

3. *Atherina presbyter.*

jaw to be seen [1]. A third large species, also common to both our seas, is the

M. chelo, Cuv., particularly distinguished by its extremely bulky fleshy lips, whose edges are ciliated, and by teeth, which dip into their substance like so many hairs; the maxillary is recurved, and shows itself behind the commissure.

M. labeo, Cuv., a small Mediterranean species, has, in proportion to its size, still larger lips, with crenated borders. Several of these thick-lipped species are found in the Indian Ocean [2].

TETRAGONURUS, *Risso.*

So called from the two salient crests that are found on each side, near the base of the caudal, is another of those insulated genera which seem to indicate particular families.

These fishes are partly allied to the mullets, and partly to the scomberoïdes. Their body is elongated;

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[1] Add the *M. christian*, Voy. Freycin. *M. Ferrandi*, ib. *M. parsia*, Buch. pl. xvii. f. 71. *M. cascasia*, Id. *M. peradak*, Cuv., Russell 182.

[2] *M. crenilabis,* Forsk. *M. cirrhosthomus*, Forst., App. Bl. Schn. 121.

N. B. The *M. cœruleo-maculatus*, Lacép. v. 389. the same represented under the name of *crenilabis*, pl. xiii. f. 1. belongs to the same group as the capito. The *Mugil appendiculatus*, Bosc. or *Mugilomore Anne-Caroline*, Lacép. v. 398. is nothing else than the *elops*, which is also the fact as respects the *Mugil salmoneus,* Forst., Bl., Schn. 121. *Mugil cinereus*, Walbaum, Catesb. II. xi. 2. is a Gerres. The *M. chanos*, Forsk., belongs to the Cyprinidæ.

their spinous dorsal long, but very low; the soft one approximated to it, shorter but higher; the anal corresponds to the latter; the ventrals are at a little distance behind the pectorals; the branches of the lower jaw, which are raised vertically, and provided with a range of cutting pointed teeth, forming a kind of saw, are enclosed when the mouth is shut by those of the upper one. There is also a small series of pointed teeth in each palatine, and two in the vomer. Their stomach is fleshy and folded, their cœca numerous, and their intestine long. The œsophagus is furnished internally with hard and pointed papillæ.

Tetrag. Cuvieri, Risso, *Courpata*, or *Corbeau* of the Mediterranean coast, is the only species known, and is never taken except in very deep water. It is a foot long, and black, the scales hard, deeply striate, and indented. The flesh is said to be poisonous[1].

I also place between the mugiloïdes and the gobioïdes a genus, which does not completely harmonize with any other. It is the

ATHERINA, *Lin.*

The body elongated; two dorsals widely separated; the ventrals further back than the pectorals; the mouth highly protractile, and furnished with very minute teeth; a broad silvery band along each flank on all the known species. There are six rays in the branchiæ; the stomach has no cul-de-sac, and their duodenum no cœcal appendages. The transverse processes of the last abdominal vertebræ are bent, and thus form a little cone or cornet, which receives the point of the natatory bladder. These little fishes are highly esteemed for the delicacy of their flesh. The young ones remain for a long time in crowded troops, and are consumed on the coast of the Mediterranean under the name of *Nonnat*, the *Aphyes* of the ancients. Several species inhabit the European seas, hitherto confounded under the name *Ath. hepsetus*, L.

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[1] There is no good figure of it. *Mugil niger*, Rondel. 423. *Corvus niloticus*, Aldrov., Pisc. 610. Risso, Ed. i. pl. x. f. 37.

Ath. hepsetus, Cuv.[1]; *Sauclet* of Languedoc, or *Cabassous* of Provence; Rondel. 216; Duham. sect. vi. pl. iv. f. 3. The head somewhat pointed; nine spinous rays in the first dorsal, eleven soft ones in the second, and twelve in the anal; fifty-five vertebræ in the skeleton.

Ath. Boyer, Risso; *Joel*, or *Cabassouda*, Rondel. 217. The head broader and shorter, the eye larger; seven spines in the first dorsal, eleven rays in the second, thirteen in the anal; forty-four vertebræ in the skeleton.

Ath. mochon, Cuv. The form of the sauclet; but there are seven spines in the first dorsal, fifteen soft rays in the anal, and forty-six vertebræ.

Ath. presbyter, Cuv.; the *Prêtre*, *Abusseau*, &c.

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[1] This is probably the especial type of the hepsetus of Linnæus. It is necessary to observe that the figure called *Atherina hepsetus*, Bl. pl. cccxciii. f. 3. and Syst. pl. xxix. f. 2. is purely ideal.

Duham. sect. vi. pl. iv. f. 1,2, 3, 4, 5, 6, 7. The muzzle a little shorter than that of the sauclet; eight spines in the first dorsal, twelve soft rays in the second, fifteen or sixteen in the anal, and fifty vertebræ. The name of this fish is derived from the silvery band on the flanks, which has been compared to a stole [1].

The twelfth family of the acanthopterygii, or that of

GOBIOIDES,

Is known by the slender and flexible dorsal spines. All these fishes have about the same kind of intestines, that is, a large, uniform, intestinal canal without cœca, and no natatory bladder.

BLENNIUS, *L.*

Have a strongly marked character in the ventral fins, which are placed before the pectorals, and consist of only two rays. The stomach is slender, and has no cul-de-sac; the intestine large, but without a cœcum, and there is no natatory bladder. The body is elongated and compressed, and has but a single dorsal, almost entirely composed of simple but flexible rays.

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[1] The atherinæ foreign to Europe are numerous. *Ather. lacunosa*, Forst., Bl. Schn. 112., probably the *hepsetus*, Forsk. 69. *A. endrachtensis*, Quoy. and Gaym., Freycin. Zool. p. 334. *A. Jacksoniana*. id. 333. *A. brasiliensis*, id. 332. *A. neso-galica*, Cuv., Lacép. v. pl. xi. f. 1., which is not the same as the *A. pinguis* of the text. *A. mœnidia* of Lin., which is not, as he supposes, the *mœnidia* of Brown, Jam. pl. xlv. f. 3., but is the *A. notata*, Mitch. i. pl. iv. f. 6.; and several others to be described in our Ichthyology.

They live in small troops among the rocks on the coast, leaping and playing, and are capable of living without water for some time. A slimy mucus is smeared over their skin, to which they owe their Greek name of *Blennius*. Several are viviparous, and there is a tubercle near the anus of all of them, and in both sexes, which appears destined for the purposes of coition. We divide them as follows :

BLENNIUS (proper), *Cuv.*

Long, equal, and closely set teeth, forming but a single and regular range in each jaw, terminated behind in some species by a longer and hooked tooth. The head is obtuse, the muzzle short, and the forehead vertical; the intestines broad and short. Most of them have a tentacular appendage on each brow, finished in many cases by a plume or tuft, and several have another on each temple. Several species of this subdivision are taken along the coast of France. One of the most remarkable is the

Bl. ocellaris, Bl. 167. 1. The dorsal bilobate. Its anterior lobe elevated, and marked with a round and black spot, surrounded with a white circle and a black one.

Bl. tentacularis, Brunn., Bl. 167. 2., under the name *Bl. gattorugine*. The dorsal entire, four filaments on the brows ; a black spot between the fourth and fifth rays.

Bl. gattorugine, L., Will. ii. 2. and Bl. 162. 1, 2., under the name of *Bl. fasciatus.* But two filaments; dorsal almost entire, marked with clouded and oblique brown bands.

Bl. palmicornis, Cuv., Penn. Cop. Encyc. Méthod. f. 111., under the name of *gattorugine.* The dorsal even; the appendage over the eye fimbriated[1].

Others have only the tufts scarcely visible at the brows, but they have a membranous prominence on the vertex, which dilates and becomes red in the nuptial season. Some of them are found in the European seas. Such are

Bl. galerita, L., Rondel. 204.; *Bl. pavo,* Risso. The dorsal entire; spotted and streaked with blue; a black ocellated spot behind the eye.

Bl. rubriceps, Risso. Three first rays of the dorsal elevated, forming a red point; top of the head of the same colour.

In others again, the PHOLIS, Artedi, there is neither tuft nor crest. One of them, a very small fish, is common on the coast of France.

Bl. pholis, L., Bl. 71. 2. Profile vertical; the dorsal slightly emarginate, dotted and marbled with brown and blackish[2].

We distinguish from these blennies, properly so termed, by the name of

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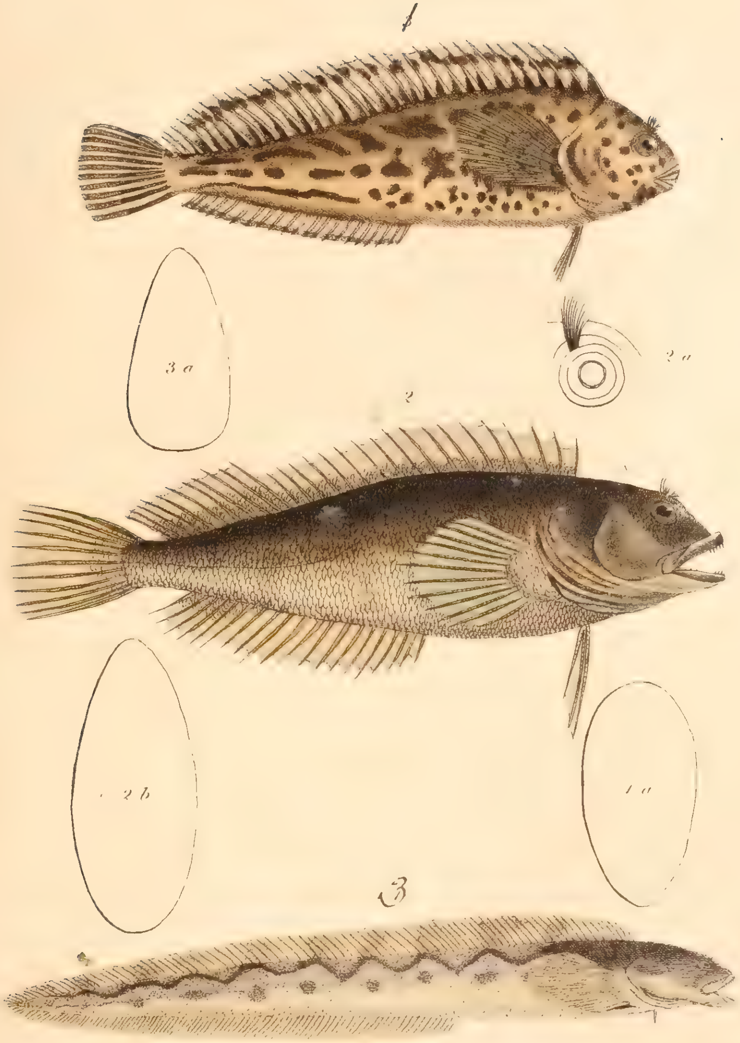
[1] Add *Bl. cornutus,* L.; *Bl. pilicornis,* Cuv. *punaru,* Marcgr. 165., the second figure, but the first description, &c.

[2] *Pholis* is the Greek name of a fish always enveloped in mucus. Add *Bl. carcinosus,* Sch. 37. 2. *Gadus salarias,* Forsk. p. 22.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1 *Blennius palmicornis*

2 *Clinus pectinifer*

3 *Zoarcus blennoides*

MYXODES, *Cuv.*,

Species with an elongated head, a pointed muzzle projecting in front of the mouth, and a single range of teeth, as in the blennies, but without canines. The species are new.

And by that of

SALARIAS, *Cuv.*

Species whose teeth, also forming a single range, and placed close to each other, are compressed laterally, hooked at the end, inexpressibly slender, and immensely numerous. They move, in the living subject, like the keys of a harpsichord. Their head, strongly compressed above, is very broad below; their lips are thick and fleshy, their profile is completely vertical, and their spirally convoluted intestines are longer and thinner than in the common blenny. The only species known are from the Indian Ocean[1].

We call

CLINUS, *Cuv.*

Those with short pointed teeth, scattered in several ranges, the first of which is the largest. Their muzzle is less obtuse than in the two preceding subgenera, their stomach wider, and their intestines shorter. *Clinus* is the modern Greek name for the blenny.

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[1] *Sal. quadripinnis,* Cuv., which is the *Blennius gattorugine,* Forsk. p. 23. *Bl. Simus,* Sujef. Act. Petrop. 1779. part ii. pl. vi.; the *Alticus* or *Saltator* of Commers., Lacép. ii. p. 479., and several new species. I have every reason to believe that to this subgenus we should also refer the *Bl. edentulus,* Bl. Schn., or the *truncatus* of Forster, notwithstanding it is said to be without teeth.

In some the first rays of the dorsal form a point separated by an emargination from the rest of the fin; small fringed appendages *(panaches)* on the eyebrows [1].

There are even some of them in which the first rays are altogether forward, and seem to form a pointed and radiated crest on the vertex [2].

In others again the dorsal is continuous and even [3].

CIRRHIBARBA, *Cuv.*

The form of a clinus; teeth small and crowded, and besides a little tentaculum over the eye, and one in the nostril, there are three large ones at the end of the muzzle, and eight under the point of the lower jaw.

But one species is known, from India, of a uniform fawn-colour.

MURÆNOIDES, *Lacép.* CENTRONOTUS, *Schn.*

The ventrals smaller than in any of the other blennies, and frequently reduced to a single ray. Their head is very small, and their body elongated like the blade of a sword; a dorsal, all of whose rays are simple and without articulation, extends along the whole length of the back. The teeth are like those of a clinus, and the stomach and intestines of one uniform appearance.

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[1] *Bl. mustelaris*, L., Mus. Ad. Fred. xxxi. 3. *Bl. superciliosus*, Bl. 168. *Bl. argenteus*, Risso.

N.B. The *Blennie pointillé*, Lacép. II. xii. 3., appears to me to be a badly preserved specimen of the *superciliosus*.

[2] *Bl. fenestratus*, Forst., Bl. Schn. p. 173.

[3] *Bl. spadiceus*, Schn., Séb. III. xxx. f. 8. *Bl. acuminatus*, id., Séb. ib. 1. *Bl. punctatus*, Ott. Fabr. Soc. Hist. Nat. Copenh. vol. ii. fasc. ii. pl. x. f. 3. *Bl. Audifredi*, Risso, pl. vi. f. 15. *Bl. capensis*, Forster, Bl. Schn. 175. *Bl. lumpenus*, Walb. Arted. Renov. part iii. pl. iii.

Bl. gunnellus, L., Bl. 71. 1., Lacép. II. xii. 2. Very abundant on the coast of France: there is a suite of ocellated spots along the whole base of the dorsal.

OPISTOGNATHUS, *Cuv.*

The form of a true blenny, and particularly its short snout; distinguished by very large maxillaries, prolonged behind into a kind of long, flat moustache; rasp-like teeth in each jaw, the external row strongest; three rays in the ventrals, which are placed exactly under the pectorals.

O. Sonnerati, Cuv., is the only species known; it was brought from the Indian Ocean by Sonnerat.

ZOARCUS, *Cuv.*

We dare not separate these fishes from the blennies, although they have no spinal ray, for they are provided with their anal tubercle, intestines without cœca, and smooth oblong body; six rays in the branchiæ. There are three rays in the ventral; teeth conical, forming a single row on the sides of the jaws, and several in front; none in the palate; the dorsal, anal, and caudal are united, not, however, until the dorsal is considerably depressed.

Z. viviparus, Bl. viviparus, L., Bl. 72. A foot long; fawn-coloured with blackish spots along the dorsal; from the seas of Europe and throughout the north: it has been long recognized as viviparous.

Z. labrosus, Cuv.; *Bl. labrosus,* Mitch. op. cit. i. 1. 7. A much larger American species, which is three feet and more in length; it is of an olive colour, sprinkled with brown spots.

ANARRHICHAS[1], *Lin.*

So very similar are these fishes to the blenny, that I would willingly name them *blennies without ventrals.* The dorsal fin entirely composed of simple, but not stiff rays, commences at the nape of the neck, and extends, as well as the anal, close to that of the tail, which is rounded, as well as the pectorals. Their whole body is smooth and slimy; their palatine bones, vomer, and mandibles are armed with stout bony tubercles, surmounted with small enamelled teeth; the anterior ones, however, are longer and more conical. This mode of dentition furnishes them with powerful weapons, which, added to their great size, render them ferocious and dangerous. They have six rays to the gills; the stomach short and fleshy, with the pylorus near its bottom, the intestine short, thick, and without cœca, and they want the air-bladder.

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[1] *Anarrhichas,* climber, a name invented by Gesner (Paralipomen. p. 1261.), because this fish is said to climb upon rocks and shoals by the aid of its fins and tail.

A. lupus, L., Bl. 74. (the sea-wolf,) is the most common species; it inhabits northern seas, and is frequently seen on the coast of Europe; six or seven feet long; brown with clouded bands of deep brown; the flesh resembling that of an eel. This fish is valuable to the Icelanders, who salt and dry the flesh for food, employ the skin as shagreen, and the gall as soap[1].

GOBIUS, *Lin.*

Commonly called *Gobies,* or *Sea-gudgeons,* are instantly recognized by the union of their thoracic ventrals, either along the whole of their length, or at least at their base, forming a single hollow disk more or less infundibuliform. The spines of the dorsal are flexible, the branchial apertures provided with five rays only, and generally but slightly open. Like the blennies, they can live for some time out of the water, their stomach has no cul-de-sac, and the intestinal canal is not furnished with cœca; finally, the males have the same little appendage behind the anus, and some species are known to be viviparous. They are small, or moderately sized fishes, which live among the rocks near the shore. Most of them have a simple natatory bladder.

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[1] The petrified teeth of this fish have been considered as constituting *Bufonites,* but they have neither their form nor tissue. Add the *Anarrh. minor,* Olafsen. Voy. in Isl. Fr. trans. pl. L.

GOBIUS (properly so called), *Lacép.* and *Schn.*

In the true gobies the ventrals are united throughout their whole length, and even before their base, by a traverse, so as to form a concave disk. The body is elongated, head moderate and rounded, cheeks inflated, and the eyes approximated; two dorsal fins, the last of which is long. Several species inhabit the seas of Europe, whose characters are not yet sufficiently ascertained[1].

These fishes prefer a clayey bottom, where they excavate canals in which they pass the winter. In the spring they prepare a nest in some spot abounding with fucus, which they afterwards cover with the roots of the zostera; here the male remains shut up, and awaits the females, who successively arrive to deposit their eggs; he fecundates them, and exhibits much care and courage in defending and preserving them[2].

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[1] Belon and Rondelet have endeavoured to prove that this fish is the *Gobius* of the ancients; and Artedi pretends to have found in the ocean the badly determined Mediterranean species of those authors: hence has arisen a most inextricable confusion, to disentangle which, it is necessary to re-commence both description and figures, a task we shall partially undertake in our Ichthyology.

[2] These observations were made by the late Olivi, on a goby of the canals of Venice, which he considers identical with the *niger*, but which is perhaps another of the Mediterranean species; they are given by M. de Martens in the second volume of his Voyage to Venice, p. 419. My conclusion is, that the goby is the *phycis* of the ancients, "*the only fish that constructs a nest.*" Arist. Hist. lib. viii. cap. xxx.

G. niger, L. Penn. Brit. Zool. pl. xxxviii. (the common Goby). Body blackish brown; the dorsals bordered with whitish; the most common species on the coast of Europe. The extremities of the superior rays of the pectorals are free; length four or five inches.

G. jozzo, Bl. 107. f. 3. (the blue Goby). Brown, marbled with blackish; blackish fins; two white lines on the first dorsal, whose rays are prolonged in filaments above the membrane.

G. minutus, L. Aphia, Penn. pl. 37, (the white Goby). Body of a pale fawn colour; fins whitish, transversely marked with fawn-coloured lines; length from two to three inches.

The Mediterranean, which is perhaps inhabited by these three species, produced several others of different sizes and colours[1].

G. capito, Cuv.; Gesner. 396. (the great Goby). Olive, marbled, with blackish; lines of blackish points on the fins; the head broad, and the cheeks inflated; length one foot and more.

G. cruentatus, Gm. (the bloody Goby). Large; brown, marbled with grey and red; lips and operculum marbled with a blood-red; red lines on the first dorsal; lines of salient points forming an H on the nape of the neck, &c.

Some species are also found in fresh water; such is the *Gob. fluviatilis*, observed by Bonnelli, in a lake in

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[1] See the descriptions of them, but without entirely adopting the nomenclature, in Riss. Icht. de Nice, p. 155, &c.

Piedmont, smaller than the *niger*, blackish, without the free pectoral filaments, and a black spot above the branchial aperture. A large one is obtained in the environs of Bologna, the *G. lota*, Cuv.; brown, blackish veins on the cheek; a little blackish spot on the base of the pectoral, and another on each side of that of the caudal.

Among the gobies foreign to Europe, we may observe the *G. macrocephalus*, *Cottus. macroceph.*, Pall. Nov. Act. Petrop. I. pl. x. f. 4, 5, 6, on account of the extreme length of its head, and the *G. lanceolatus*, Bl. 33. 1; *G. bato.*, Buch. pl. xxxvii. f. 10; *Eleotris lanceolata*, Bl., Schn. pl. xv., which we call the *gobius elongatus*, on account of their elongated form and pointed caudal[1].

GOBIOIDES, *Lacép.*,

Only differ from the gobies in the union of their dorsals, which form but one. Their body is more elongated[2].

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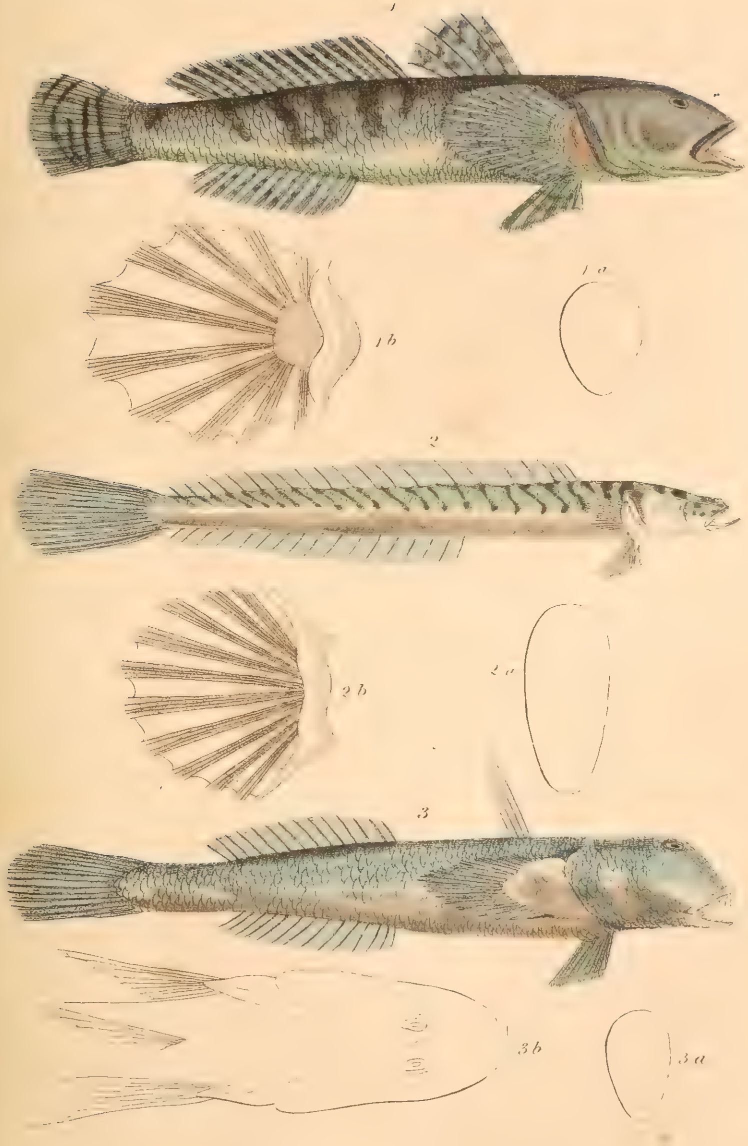
[1] Among these species foreign to Europe, we may unhesitatingly place the *Gobius Plumierii*, Bl. 175. 3. *G. lagocephalus*, Pall. VIII. pl. xi. f. 6, 7. *G. Boddarti*, id. ib. pl. i. f. 5. *G. ocellaris*, Brouss. Dec. pl. xi. *G. bosc.* Lacép. II. xvi. 1. or *G. viridi-pallidus*, Mitch. op. cit. i. 8. or *G. alepidotus*, Bl. Schn. *G. Russelii*, Cuv., Russell i. 53. *G. giuris*, Buch. pl. xxxiii. f. 13. Rus. 1. 50. *G. changua*, Buch. pl. v. f. 10. The *Bostryche Chinois*, Lacép. II. xiv., and many new species to be described in our Hist. des Poissons.

[2] *Gob. broussonet*, Lacép. ii. pl. xvii. f. 1. *Gob. oblongatus*, Schn., add 548.


1
1 a
1 b
2
2 a
2 b
3
3 b
3 a

1 Gobius capito.

2 Gobioides Broussonetii

3 Periophthalmus Freycineti

[illegible]

TÆNIOIDES, *Lacép.*,

With the single dorsal of the Gobioïdes, have a still more elongated body. Their physiognomy is extremely singular; the upper jaw is very short, the lower elevated, and every where convex, ascends in front of it, being both armed with long, hooked teeth; the eye is almost reduced to nothing, and is completely hidden under the skin. The cavity of the mouth is occupied by a fleshy and nearly globular tongue; some small cirrhi beneath the lower jaw.

But one species is known, the *Tænioïde Hermannien,* Lacép., which lives in the mud of ponds in the East Indies [1].

Bloch. Schn. p. 63, very properly separates from the whole genus *Gobius,* the

PERIOPHTHALMUS, *Schn.*,

Where the entire head is scaly; the eyes are placed side by side, and provided at their inferior edge with an eyelid which can be made to cover them, and the pectorals are covered with scales for more than half their length, which gives them the appearance of being attached to a sort of arms. Their gills being even narrower than those of other gobies, they can live out of water for a still longer period. They are often seen in the Moluccas, where they inhabit, creeping and leaping over the mud, either to escape from their enemies, or to seize upon the small shrimps, which constitute their chief food.

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[1] It is the *cepola cæcula,* Bl. Schn. pl. liv. from a drawing by John. The *Tænioïde hermannien,* Lacép. II. xix. 1. from a Chinese drawing; and the *Gobioïde rubicunda,* Buch. pl. v. f. 9.

Some of them have the concave, disc-like ventrals of the true gobies [1].

The ventrals of others are divided nearly to the base [2].

I would also separate the

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[1] *Gobius Schlosseri*, Pall. Spic. viii. pl. i. f. 1—4 ; to which must be added the *Gob. striatus*, Schn. xvi., left among the *gobies*, though it is hard to say why, since it is a true *Periophthalmus*.

[2] *Gobius Kœlreuteri*, Pall. Spic. viii. pl. xi. f. 13. *Per. ruber*, Schn. *Per. papilio*, Schn. pl. xxv.

N.B. Both the gobies and the periophthalmi, with divided ventrals, according to the system of M. de Lacépède, would be *Gobiomores;* if, together with this division of the ventrals, they had but one dorsal, they would be *Gobiomoroïdes;* but the species arranged under these two genera have not all their characters. The *Gob. Gronovii*, Gm., Marcgr. 153, does not belong to this family, it is our genus NOMEUS, of the family of the *Scomberoïdes*. The *Gobiomoroïde pison*, *Gob. pisonis*, Gm., *Amore pixuma*, Marcgr. 166, *Eleotris*, 1. Gron. Mus. 16, has not the character of this genus, for it has two dorsals, both in the figure of Marcgr., and in the description of Gronovius, and by its ventrals is an *eleotris*.

Bloch., Ed., Schn., p. 65, separates from the gobies, and forms into the genus *eleotris*, different from that of Gronovius which bears the same name, those species whose ventrals are merely united like a fan, without being infundibuliform ; but in those which I have examined, the membrane which unites the external edges in front, is merely somewhat shorter in proportion, which has prevented it from being observed, and for this reason I leave them among the gobies.

ELEOTRIS, *Gronov.*

Fishes, which, like the gobies, have flexible spines in the first dorsal, and the post-anal appendages, but whose ventrals are entirely distinct, the head obtuse and slightly depressed, the eyes at a distance from each other, and six rays in the branchial membrane. Their lateral line is but slightly marked, and their viscera are similar to those of the gobies. Most of them inhabit fresh water, and frequently live in the mud.

E. dormitatrix, Cuv. *Platycephalus dormitator,* Bl., Schn, (the Sleeper). Tolerably large, with a depressed head, inflated cheeks, and fins spotted with black. From the marshes of the Antilles[1].

They are also found in Senegal and in India[2].

A small species is taken on the coast of the Mediterranean, *Gobius auratus,* Risso, of a golden colour, with a black spot on the base of the pectoral. It is an *Eleotris,* and not a Goby.

CALLIONYMUS, *Lin.*

Fishes of this genus have two strongly marked characters; one in their branchiæ, which have but a single aperture, consisting of a hole on each side of the nape, and another in their ventrals, which are placed under the throat, are separate, and larger than the pectorals. Their head is oblong and depressed, their eyes approximated and directed upwards, their intermaxillaries very protractile, and their preopercula elongated behind, and terminating in some spines. Their teeth are small and crowded, but there are none in the palate. They are pretty fishes, with a smooth skin, whose anterior dorsal, supported by a few setaceous rays, is sometimes very elevated. The second dorsal is elongated as well as the anal. They have the same post-anal appendage as the preceding ones. There is no cul-de-sac to their stomach, and the natatory bladder and cœca are wanting[1].

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[1] It is the *gobiomore dormeur,* Lacép. Add the *Guavina,* Parr. pl. xxxix. f. 1. The *Amore guaçu,* Marcgr. 66. The *Amore pixuma,* id. ib. or *Gob. pisonis,* Gm.

[2] The *Gob. strigatus,* Brouss. Dec. pl. i.; or *Gobiomore taiboa,* Lacep. copied in Encyc. Méth. f. 138. The *Eleotris noir,* Quoy and G., op. cit. pl. lx. f 2, and the *Sciæna macrolepidota,* Bl. 298; and *Maculata,* id. 299. 2, which constituted my former genus *Prochilus,* which must be suppressed.

One of them is common in the British Channel, the

Call. lyra, L., Bl. 161; Lacép. II. x. 1. The first dorsal elevated, and the second ray extended into a long filament; orange spotted with violet. The *Call. dracunculus*, Bl. 162, only differs from it in the first dorsal being short, and without the filament. Several authors consider it the female. Some others are found in the Mediterranean, such as

Call. lacerta, Cuv., Rond. 304, and not so well, *Call. pusillus*, Laroche, Ann. Mus. XIII. xxv. 16. First dorsal low; the second much elevated in the male; silvery points, and white black-edged lines on the flanks; the caudal long and pointed [1].

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[1] *Callionymus*, (beautiful name) is one of the names of the Uranoscopus among the Greeks. Linnæus applied it to the present genus.

TRICHONOTUS, *Schn.*,

Appears to be a mere callionymus, with a very elongated body, whose single dorsal and anal have a corresponding length. The first two rays of the dorsal, extended into long setæ, represent the first dorsal of the common callionymus. The branchiæ, however, are said to be well cleft [2].

COMEPHORUS, *Lacép.*

First dorsal very low; the muzzle oblong, broad and depressed; gills much cleft, with seven rays; very long pectorals, and, what constitutes their distinguishing character, a total absence of ventrals.

But one species is known, from lake Baikal, the *Callionymus baicalensis*, Pall. Nov. Act. Petrop. I. ix. 1; a foot long, of a soft fatty substance, from which oil is obtained by compression. It is only to be had when dead, after a storm.

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[1] N.B. The *Call. diacanthus*, Carmich., Lin. Trans. xii. pl. xxvi. does not appear to me to belong to this genus. The *Call. Indicus*, Lin., is nothing more than the *Platycephalus spatula*, Bl. 424. Add *Call. cithara*, Cuv. *C. jaculus*, and other new Mediterranean species; and, of species foreign to Europe. The *C. orientalis*, Schn. pl. vi. *C. ocellatus*, Pall. viii. pl. iv. f. 13. *C. sagitta*, id. ib. f. 4, 5; and some others to be described in our Ichthyology.

[2] *Trichonotus setigerus*, Bl., Schn. pl. xxxix.

PLATYPTERUS, *Kuhl.* and *Van Hasselt.*

The broad and separated ventrals of a callionymus; a short depressed head; the mouth small, and branchiæ open; scales broad; the two dorsals short and separated[1].

It is with some hesitation that I close this family with a genus which will one day probably form the type of a separate family; I mean the

CHIRUS, *Stell.* LABRAX, *Pall.*

Fishes with a tolerably long body, furnished with ciliated scales; a small unarmed head; slightly cleft mouth, provided with small, unequal, conical teeth; the spines of whose dorsal are almost always very delicate, the fin itself extending the whole length of the back. Their distinguishing character consists in several series of pores, similar to the lateral line, or, as it were, in several lateral lines. There are no cœca to the intestines; they frequently have an appendage to the eye-brow, as is the case with certain blennies; but their ventrals consist of five soft rays, as usual. The species known are from the sea of Kamtschatka[2].

I form a thirteenth family, that of the

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[1] *Platyptera melanocephala*, K. and V. H. *Pl. trigonocephala*, Id. two fishes from India, to be described in our Ichthyology.

[2] *Labrax lagocephalus; L. decagrammus; L. superciliosus; L. monopterygius; L. octogrammus; L. hexagrammus;* all described and figured by Pallas, Mem. Acad. Petersb. Vol. xi. 1810.

Pectorales Pediculati,

Of some acanthopterygii, whose carpal bones are elongated so as to form a sort of arm, which supports their pectorals. It comprises two genera, which are closely approximated, although authors have generally placed them at a distance from each other, and which are closely allied to the gobioides.

Lophius, *Lin.*

The general character of this genus, independently of the semi-cartilaginous skeleton, and the naked skin, consists in the pectorals being supported by two arms, as it were, each of which is formed of two bones that have been compared to the radius and ulna, but which in reality belong to the carpus, and which in this genus are longer than in any other; in the ventrals being placed very far before these pectorals; in opercula and branchiostegous rays enveloped in the skin; and, finally, in the only opening of the gills being a hole situated behind the said pectorals. They are voracious fishes, with a wide stomach, and short intestine, which survive a long time out of water, on account of the smallness of their branchial apertures[1].

Lophius (proper), *Cuv.*,

The head excessively large in proportion to the rest of the body, very broad and depressed, and spinous in many places; the mouth deeply cleft, and armed with pointed teeth; the lower jaw furnished with numerous cirri; two distinct dorsals, some rays of the first separated before, free and moveable on the head; the branchial membrane forming a very large sac, opening in the axilla, and supported by six very long rays; the operculum small. There are but three branchiæ on each side. It is asserted that these fishes live in the mud, where, by agitating the rays of their head, they attract smaller ones, who take the often enlarged and fleshy extremities of those rays for worms, and thus become their victims; it is also said that they can seize or retain them in their branchial sac[1]. They have two very short cœca near the origin of the intestine, but no natatory bladder.

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[1] N.B. *Lophius* from *λοφια*, *(pinna)* on account of the crests of their head: the ancients named them *βατραχος*, and *rana*, (frog).

L. piscatorius, L., Bl. 87. *Sea devil, Galanga*, &c. (the Angler). A large fish of from four to five feet in length, inhabiting the seas of Europe, whose hideous figure has rendered it celebrated.

L. parvipinnis, Cuv. A very similar species that is found in the same seas; its second dorsal, however, is lower, and it has only twenty-five vertebræ, while the piscatorius has thirty[2].

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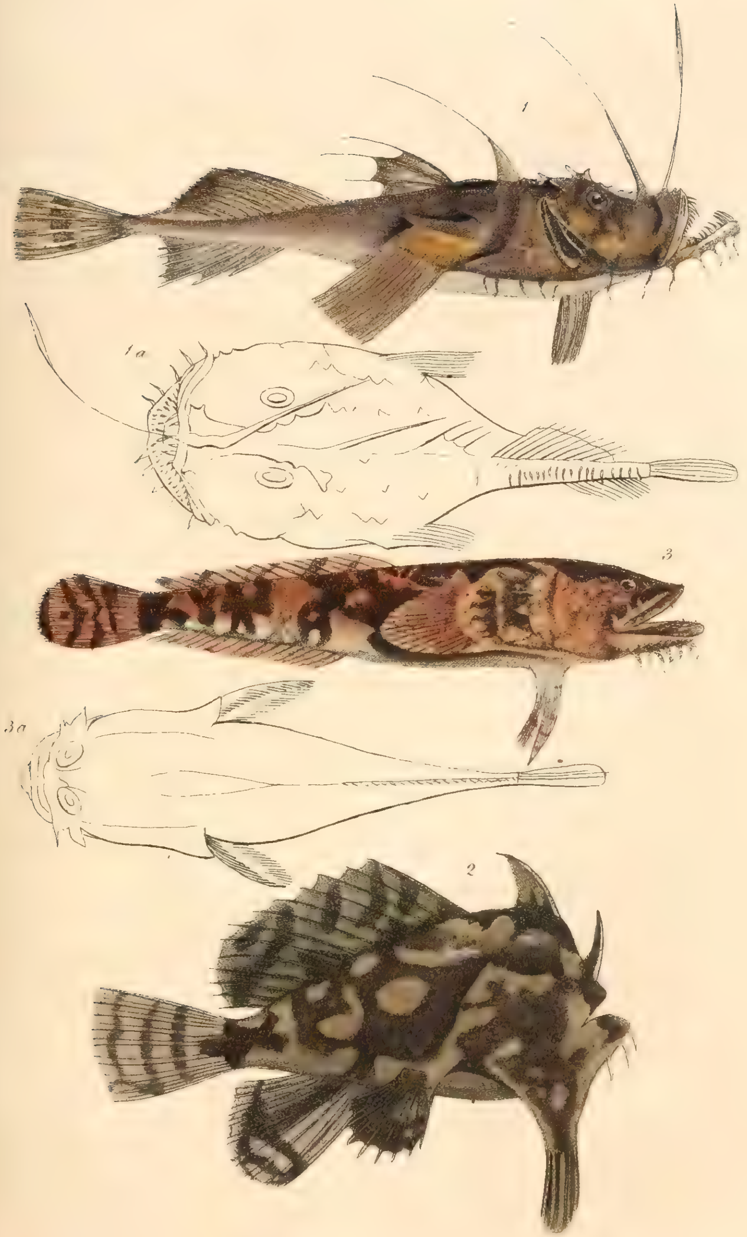
[1] Geoffroy, Ann. du Mus. X. p. 108.

[2] We are ignorant whether it is the *Lophius budecassa* of MM. Spinola and Risso or not, that species being described as more fawn-coloured and varied than the common one.

Add the *Loph. setigerus*, Vahl. Soc. Hist. Nat. Copenh. iv. p. 215, and pl. iii. f. 5 and 6, improperly named *viviparus*, by Bl. Syst. pl. xxxii.

[N.B.



1 *Lophius piscatorius.*
2 *Antennarius nesogallicus.*
3 *Batrachus surinamensis.*

London, Published by Whittaker & C°. Ave Maria Lane 1834

CHIRONECTES. ANTENNARIUS, *Commers.*

Free rays on the head, as in lophius; the first of which is slender, and frequently terminating in a tuft; the succeeding ones, augmented by a membrane, are sometimes much enlarged, and at others united into a fin. The body and head are compressed; the mouth cleft vertically; the only opening of the branchiæ, which are furnished with four rays, is a canal and a small hole behind the pectoral; the dorsal occupies nearly the whole length of the back. The entire body is frequently provided with cutaneous appendages; there are four branchiæ; the natatory bladder is large, and the intestine moderate, and without cœca. These fishes, by filling their enormous stomachs with air, are enabled, as well as the tetrodontes, to expand their belly like a balloon; on land their pairs of fins enable them to creep almost like small quadrupeds, the pectorals, from their position, performing the functions of hind feet, and thus they live out of water for two or three days. They are found in the seas of hot climates, and several of them were confounded by Linnæus under the name of *Lophius histrio*[1].

N.B. The *Baudroye Ferguson*, Lacép. Phil. Trans. LIII. xiii. The *Lophius cornubicus*, of Sh., Borlase. Cornw. xxvii. 6. The *L. barbatus*, Gm. Act. Stockh. 1779, fasc. iii. pl. iv., are merely altered specimens of the *Piscatorius*. The *L. monopterygius*, Shaw, Nat. Misc. 202 and 203, is a torpedo disfigured by the stuffer.

[1] Species *Chiron. pictus*, Cuv.; or *Lophius histrio-pictus*, Bl., Schn. 142; or Mém. Mus. III. xvi. 1. *Ch. tumidus*, Cuv., Mus., Ad. Fred, p. 56. *Ch. lævigatus*, Cuv.; or *L. gibbus*, Mitch. op.

We might distinguish those species in which the second and third rays are united into a fin, which is sometimes even joined to the second dorsal[1].

MALTHE, *Cuv.*

The head excessively elongated, and flattened chiefly by the projection and volume of the suboperculum; the eyes forwards; the snout salient like a small horn; the mouth beneath the snout moderate and protractile; the branchiæ supported by six or seven rays, and opening on the dorsal surface by a hole above each pectoral; a single, small, and soft dorsal; the body studded with osseous tubercles, with cirri the whole length of its sides; but there are no free rays on the head. The cœca and natatory bladder are wanting[2].

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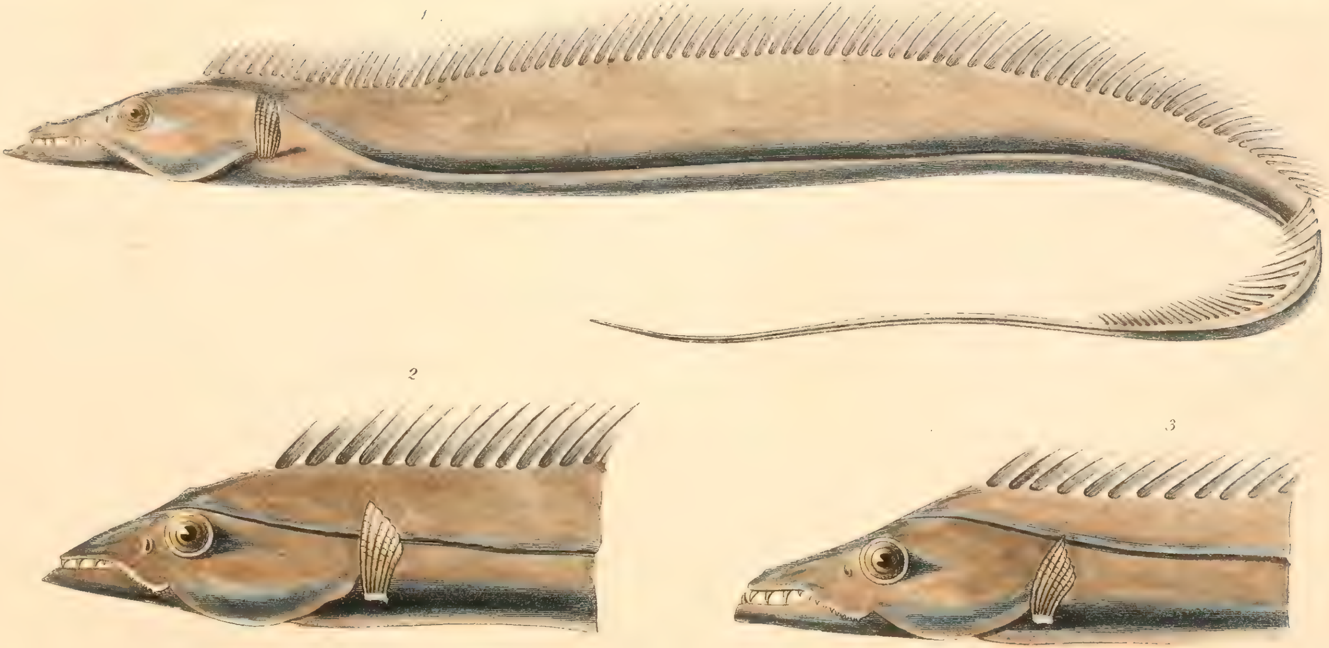
cit. I. vi. 9. *Ch. marmoratus*; or *L. Hist. marm.* Bl., Schn. 142, Klein. Misc., III. iii. 4; or *L. raninus*, Tiles. Mem. Nat. Mosc. II. xvi. *Ch. hispidus*, Bl., Schn. 143, Mem. Mus. III. xvii. 2. *Ch. scaber*, ib. xiv. 2; or *Guaperva*, Marcgr. 150, (but not the figure). *L. histrio*, Bl. pl. cxi. *Ch. biocellatus*, Cuv., Mem. Mus. III. xvii. 3. *Ch. ocellatus*; or *L. histr. ocel.* Bl. Schn. 143, Parra. i. *Ch. variegatus*; or *L. cheronecte*, Lacép. I. xiv. 2; or *L. pictus*, Shaw, Zool. V. part II. pl. clxv. *Ch. furcipilus*, Cuv., Mém. Mus. III. xvii. 1. Laët. Ind. Occ. 574, a figure given for the *guaperva*, Marcgr. 150. *Ch. nummifer*, Cuv., Mem. Mus. xvii. 4. *Ch. Commersonii*, Cuv., Lacép. I. xiv. 3, and very badly, Ren. I. xliii. 212. *Ch. tuberosus*, Cuv.

[1] *Ch. punctatus*, Cuv., Mém. Mus. III. xviii.; and Lacép., Ann., Mus. IV. lv. 3. *Ch. unipinnis*, Cuv., Mem. Mus. III. xviii. 3, Lacép., Ann., Mus. III. xviii. 4.

[2] *Lophius vespertilio*, L., Bl. 110. *Malth. nasuta*, Cuv., Séb.



1 *Trachiurus armatus*   2 *Tra. muticus.*   3 *Tra medius.*

London, Published by Whittaker & Cº. Ave Maria Lane, 1834

BATRACHUS, *Bl.*, *Schn.* BATRACOÏDES, *Lac.*

The head horizontally flattened, broader than the body; the mouth well cleft; operculum and suboperculum spinous; six branchial rays; the ventrals narrow, inserted under the throat, and formed but of three rays, the first of which is elongated and widened; pectorals supported by a short arm, the result of the elongation of the carpal bones. The first dorsal is short, and supported by three spinous rays; the second is soft and long, as well as the anal which corresponds to it. The lips are frequently furnished with filaments. Those which have been dissected present a stomach resembling an oblong sac, and short intestines, but there is no cœcum. The fore part of the natatory bladder is deeply bifurcated. They keep themselves hidden in the sand to surprise their prey, like the lophius, &c.; the wounds inflicted by their spines are considered dangerous. They are found in both oceans.

Some of them have a smooth and fungous skin, and a cutaneous appendage over the eye[1].

I. lxxiv. 2. *M. notata*, Cuv. *M. angusta*, Cuv. the skeleton of which is found in Rosenthal, Bl., Ichthy. t. xix. 2. *M. truncata*, Cuv.; *M. Stellata;* or *Lophius Stellatus*, Vahl., Mem. Soc. Hist. Nat. Copenh. iv. pl. iii. f. 3, 4, the same as the *Lophie faujas*, Lacép. I. xi. 2, 3; and the *Lophius ruber*, Krusenstein's Voy. lxi.

[1] *Batrach. tau* (*Gadus. tau*, Lin.); or *Lophius bufo*, Mitch.; or *Batrachoïde verneul*, Lesueur, Mem. Mus. V. xvii. The *Batr. varié*, id. Ac. Nat. Sc. Phil. *Batr. grunniens*, (*Cottus grunniens*, L.) Bl. 179. Seb. III. xxiii. 4. *Batr. gangene*, Buch. xiv. 8. *Batr.*

Others are covered with scales, and have no appendage over the eye[1].

We might distinguish those in which the scales and cirri are wanting, but which have lines of pores pierced in the skin, and hooked teeth in the lower jaw[2].

The fourteenth family of the Acanthopterygii, or that of

Labroides,

Is easily recognized by its aspect. The body is oblong and scaly; a single dorsal is supported in front by spines, each of which is generally furnished with a membranous appendage; the jaws are covered with fleshy lips; there are three pharyngeals, two upper ones attached to the cranium, and a large lower one, all three armed with teeth, now *en pavé*, then in points or laminæ, but generally stronger than usual; an intestinal canal either without cœca, or with two very small ones, and a strong natatory bladder.

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dubius, Cuv.; or *L. dubius*, J. White, 265, Nieuho. Ap. Will. Ap. iv. 1. *Batr.* 4. *spinis*, Cuv.; or *Batr. diemensis*, Lesueur, Ac. Nat. Sc. Philad.

[1] *Batr. Surinamensis*, Bl., Schn. pl. vii. given as the *Tau*, Lacép. II. xii. 1. *B. conspicillum*, Cuv.; or the pretended *Batr. tau*, Bl. pl. lxvii. f. 2 and 3.

[2] *Bat. porosissimus*, Cuv., *Niqui*, Marcgr. 178; or the second *niqui* of Pison, 295. N.B. The first *niqui* of Pison, 294, is a badly copied figure from the collection called Mentzel's, to which the engraver has added scales.

LABRUS, *Lin.*

A very numerous genus of fishes, which strongly resemble each other in their oblong form; their double fleshy lips, from which they derive their name, one adhering immediately to the jaws, and the other to the suborbitals; their crowded branchiæ with five rays; their conical maxillary teeth, the middle and anterior of which are the longest, and their cylindrical and blunt pharyngeal teeth arranged *en pavé*, the upper ones on two large plates, the lower on a single one which corresponds to the two others. Their stomach does not form a cul-de-sac, but is continuous with an intestine without cœca, which after two inflexions terminates in a large rectum. They have a single and strong natatory bladder.

LABRUS, (properly so called).

The opercula and preopercula without spines or dentations; the cheek and operculum covered with scales; the lateral line straight, or nearly so. The seas of Europe produce several species, the variation of whose colours rarely allows them to be clearly distinguished[1].

L. maculatus, Duham., Schn. iv. pl. ii. f. 1. *Lab. maculatus,* Bl. 284.? *Lab. bergilta,* Ascan. Ic. 1. From a foot to eighteen inches in length; twenty, or twenty-one dorsal spines; blue or greenish above, white beneath; every where chequered with fawn-colour, which sometimes becomes general[1].

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[1] With respect to these fishes we can neither trust to the figures of Bloch, nor to the synonyms of Gmelin.

L. variegatus, Gm. *L. lineatus*, Pen. xlv. copied Encycl. 402. One or more clouded, irregular dark bands along the flank, on a ground more or less reddish; sixteen or seventeen spines in the dorsal, which is marked with a dark spot in front[2].

L. carneus, Bl., and *L. trimaculatus*, L. Reddish; three black spots on the posterior part of its back.

L. turdus, Gm., Salvian. 87. Green, more or less distinct; scattered spots, sometimes resembling mother-of-pearl, sometimes brown; frequently a nacred band along the flank[3].

L. merula, Gm., Salvian. 87. Black, more or less bluish; the dorsal of these three species contains from sixteen to eighteen spines. The last one is only obtained from the Mediterranean [1].

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[1] The *Vieille tachetée*, was indicated by Lacépède, under the name of *Labre neustrien*. It is possible that the *Labrus maculatus*, Bl. 294, was a bad figure of it, taken from a dried specimen, whose colours had been entirely changed. The *Labrus tinca*, Shaw, Nat. Misc. 426, and Gen. Zool. iv. pl. ii. p. 499, is a beautiful variety, red spotted with white, but is not the *tinca* of Linnæus. The *Lab. ballan*, Penn. 44, copied Encyc. 400, is the fawn-coloured variety. The *L. comber*, Penn. XL. ii. copied Encyc. 405, is a red variety, with a suite of white spots along the flank.

[2] The only good drawing of this fish is that of Pennant; I suspect the *Labr. vetula*, Bl. 293, to be an altered figure of the same; it is in the nuptial season the *Turdus perbelle pictus*, of Willough. 322; and the *Sparus formosus*, Shaw, Nat. Misc.

[3] I am of opinion that the *Lab. viridis*, and the *Lab. luscus*, Lin., are varieties of this turdus, which is subject to great changes of colour. The *L. viridis*, Bl. 282, is a Julis, Cuv., and differs from that of Linnæus.

CHEILINUS, *Lacép.*,

Differs from labrus, properly so called, in the interruption of the lateral line, opposite the end of the dorsal; it recommences a little lower down. The scales on the end of the tail are large and somewhat envelope the base of the caudal. They are beautiful fishes from the Indian Ocean [2].

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[1] Add *Lab. Americanus*, Bl. Schn.; or *Tautoga*, Mitch. pl. iii. 1. *L. hérissé*, Lacép. III. xx. 1. *L. large queue*, id. III. ix. 3. *L. deux croissants*, id. III. xxxii. 2. *L. diane*, id. iii. 1.

N.B. The *Cheil. auratus*, Commers. Lacép. iv. 433; or the *Labrus inermis* of Forsk. (*L. hassec*, Lacép.) and Voy. Freycin. Zool. pl. liv. No. 2, is merely a very slender labrus, with flexible dorsal spines.

[2] The *Cheiline trilobé*, Lacép. III. xxxi. 3, the same as the *Sparus chlorurus*, Bl. 260. *Sparus radiatus*, Bl., Schn. 56. *Sparus fasciatus*, Bl. 257, which is also the *Labre ennéacanthe*, Lacép. iii. p. 490. *Labrus fasciatus*, Bl. 290, which is also the *Labre malaptéronote*, Lacép. III. xxxi. i.; the figure to which should be referred the description of the *Labre fuligineux*, id. iii. p. 493, but not the fig., which is that of the *Mesoprion uninotatus*. *Labrus melagaster*, Bl. 296. 1. *L. diagramme*, Lacép. III. i. 2. *L. lunula*, Forsk. N.B. The *Labrus scarus*, L. (*Cheiline scare*, Lacép.) was merely established by Artedi and Linnæus, on an equivocal description of Belon. Aquat. lat. ed. p. 239, and Obs. p. 21, where it is impossible to ascertain even the genus of the fish of which he speaks. The fig. and description of Rondelet, lib. vi. cap. ii. p. 164, usually quoted with those of Belon, refer to a totally different fish of the genus sparus. The true *scarus* of the Greeks is another fish, as we shall soon see.

LACHNOLAIMUS, *Cuv.*,

The general characters of a true labrus, but the pharyngeals have no teeth *en pavés,* except at their posterior part, the remainder of their extent, as well as a part of the palate being covered with a villous membrane. These fishes are recognized at sight, by the first spines of their dorsal, which rise in long flexible filaments. The species known are from America[1].

JULIS, *Cuv.*

The head entirely smooth, and without scales; the lateral line forming an elbow opposite the end of the dorsal. Some species are found in the seas of Europe.

J. vulgaris, Labrus julis, L. Bl. 287. f. 1. A small fish remarkable for its beautiful violet hue, relieved on each side by a zig-zag line of a rich orange colour, &c. It varies greatly, is the best known of the Mediterranean species, and is also found in the ocean.

J. gioffredi, Risso. A fine scarlet; a black spot at the angle of the operculum; a gilt band along the flanks. Inhabits both the Mediterranean and the Ocean.

J. turcica, Risso. A rich green; a red streak on each scale; the head red, with blue lines; one or

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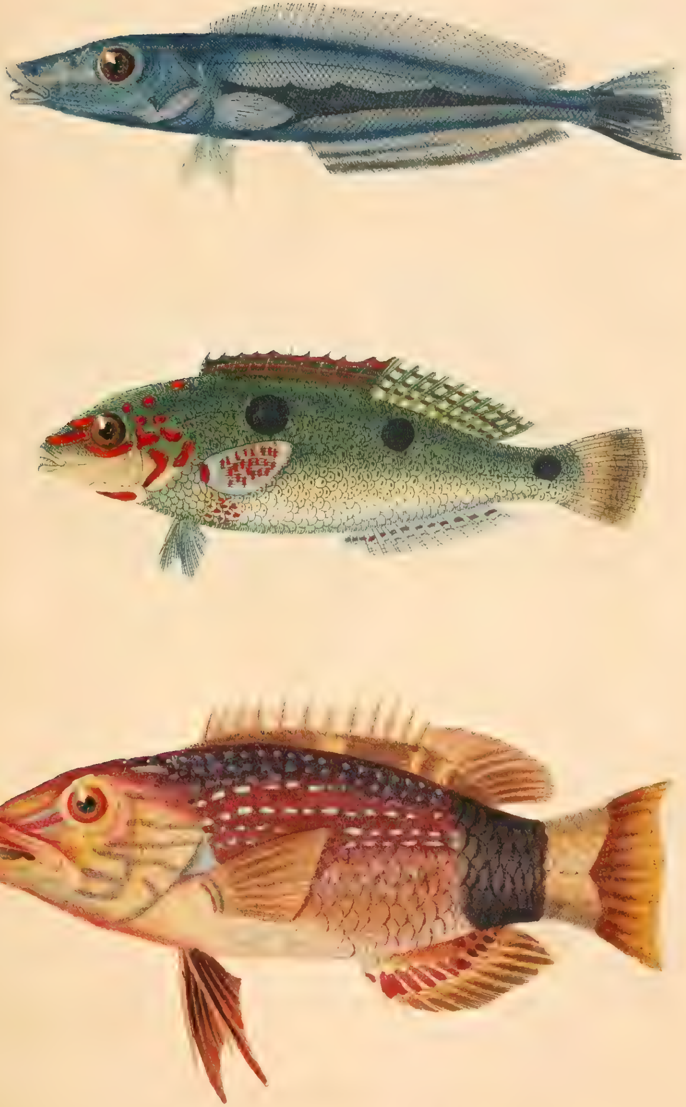
[1] *Lachnolaimus suillus,* Cuv., Catesb. II. xv. *L. caninus,* Cuv., Parra. pl. iii. f. 2.



1 *Labrus vittatus.*

2 *Julis. trimaculata.*

3 *Crenilabrus Chabrolii*

[illegible]

more vertical bands of a turquoise blue; a black spot on the pectoral; tail shaped like a crescent. One of the most beautiful fishes of the Mediterranean.

Hot climates produce numerous species of this fish, most of which are splendidly and variously coloured.

Some of them have a rounded or truncated caudal[1].

The first dorsal rays of others are drawn out into filaments[2].

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[1] Species with a round or truncated tail. *Labre parterre*, Lacép. III. xxix. 2, the same as the *Echiquier*, id. p. 493. *L. trilobé*, id. III. iv. 3. *L. ténioure*, id. III. xxix. 1, the same as his *Spare hemisphère*, III. xv. 3, and probably as his *Spare brachion*, III. xviii. 3. *L. ceinture*, id. III. xxviii. 1. *Labrus Brasiliensis*, Bl. 280. *L. macrolepidotus*, Bl. 284. 2. *L. guttatus*, Bl. 287. 2. *L. cyanocephalus*, Bl. 286. *L. malopterus*, Bl. 285. *L. chloropterus*, Bl. 288. *L. bivittatus*, 284. 1. *Julis crotaphus*, Cuv., Parra. xxxvii. 1. *L. albovittatus*, Kœhlr. Nov. Com. Pet. ix. 458, and Encyc. 399. *L. mola*, Cuv., Russ. ii. 120. *L. margaritiferus*, Cuv.; or *Gir. Labiche*, Voy. Freycin. Zool. pl., f. 3. *L. ornatus*, Carmich. Lin. Trans. XII. xxvii.

[2] The *Girelle Gaymard*, Voy. Freycin. pl. liv. which is also the *Sparus cretus*, Forst. and Renard. part I. pl. ii. No. 11, and part II. 160. N.B. The *coris* of M. de Lacépède, established by that naturalist from the drawings of Commerson, have turned out to be fishes of the present genus with truncated tails, the artist having neglected to express the separation of the operculum from the preoperculum. The *Coris angulé*, III. iv. 2, appears to be the *Labrus malapterus*, and the *Coris aigrette*, III. iv. 1, must be closely allied to the *Girelle Gaymard*. M. de Lacépède has also named *Hologymnoses*, some of these fishes, in which the scales of the body, smaller than usual, are concealed during life by a thick epidermis; but the scales

Others again have a crescent-shaped or bifurcated tail[1].

ANAMPSES, *Cuv.*

All the characters of a julis, with the exception of two flat teeth in the jaws, which project from the mouth and curve outwards.

But one or two species are known. From the Indian Ocean[2].

CRENILABRUS, *Cuv.*

We separate these fishes from the lutjanus of Bloch, in order to arrange them in their proper place. They have all the characters, external and internal, of a true labrus, and only differ in the denticulation of the border of their preoperculum.

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which do not appear in the drawing of Commerson, engraved, Lacép. III. pl. i. f. 3, are very visible in the dried specimen deposited in the Museum; that genus must, therefore, be included in Julis, together with the *Demi disque*, III. pl. vi. f. 1, the *Annelé*, ib. pl. xxviii. and the *Cerclé*, which at least are closely allied to it.

[1] Species with crescent shaped or forked tails. *Labre hébraïque*, Lacép. III. xxix. 3. *Labrus bifasciatus*, Bl. 283. *L. lunaris*, L. Gron. Mus. II. vi. 2. copied Encyc. 196. *L. lunaris*, Bl. 281, which is different, and may possibly be nothing more than altered *Julis turcica*. *L. viridis*, B. 282. *L. Brasiliensis*, Bl. 280. *Julis cœruleocephalus*, Cuv.; or *Girelle Duperrey*, Voy. Freycin. Zool. pl., f. 333. *L. argenté*, Lacép. xviii. N.B. The *Scarus gallus*, Forsk. is probably the same as *Lab. lunaris*.

[2] *Labrus tetrodon*, Bl., Schn. 263. *Anampses Curieri*, Quoy and Gaym. Voy. Freycin. Zool. pl. lv. f. 1.

[illegible] on each
[illegible]

Some of them are taken in the northern seas, such as the *Lutjanus rupestris*, Bl. 250; fawn-coloured, with clouded, blackish, vertical bands. *Lutjanus Norvegicus*, id. 256; brownish, irregularly spotted and marbled with deep brown. *Labrus melops;* orange, spotted with blue; a black spot behind the eye, pl. xxi. f. 1. *Labrus exoletus*, or *L. palloni*, Risso; remarkable for the five spines of its anal [1].

The Mediterranean produces a great number which are decorated with the most beautiful colours. The most splendid is the *Labrus lapina*, Forsk.; silvery, with three broad longitudinal bands formed of vermilion dots, yellow pectorals, the ventrals blue, &c. [2]

They abound also in the seas of hot climates [3]; and several species, hitherto left among the labri, should be placed here.

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[1] Add *Lab. gibbus*, Penn. xlvi. copied, Encyc. 403. *Lutj. virescens*, Bl. 254. 1.

[2] Risso describes several in his first edition under the name of *Lutjanus;* in the second he adopts our genus CRENILABRUS, and carries the number of species to twenty-eight; but all his species are not distinct, and his synonymes are sometimes uncertain. His species should be compared with those of Brunnich, Bloch, &c. The *Lab. venosus*, Brunn. *L. fuscus*, Brunn. *L. unimaculatus*, Brunn. *Lutjanus rostratus*, Bl. 254. 2, perhaps the *Cr. tinca*, Risso. *L. 5. maculatus*, Bl. 291. 2, is the *Crenil. Roissal.* Risso, *Lutj. bidens*, Bl. 251. 1. *L. Mediterraneus*, Brunn. *Lab. rubens*, Brunn. *L. perca*, Brunn. *Lab. spalatensis*, Br. *Lab. tinca*, Brunn. *Lab. ocellatus*, Forsk; or *Olivaceus*, Brunn, &c.

[3] At the head of the list should be the *Lutjanus verres*, Bl. 255., the same as his *Bodianus bodianus*, 223., and as the *Perro colorado*,

Coricus, *Cuv.*

All the characters of a crenilabrus; in addition to which the mouth is nearly as protractile as that of an epibulus.

The species known are small, and from the Mediterranean [1].

We must remove the following fishes from the genus sparus, in order to place them near coricus, or cheilinus.

Epibulus, *Cuv.*

Remarkable for the excessive protractility of their mouth, which, by a see-saw motion of their maxillaries, and the sliding forwards of their intermaxillaries, instantly becomes a kind of tube. They employ this artifice to capture the small fry which pass within reach of this singular instrument; it is also resorted to by the corici, zei, and smares, according to the greater or less protractility of their jaws.

The entire body and head of an epibulus is covered with large scales, the last range of which even encroaches upon the anal and caudal fins, as is the case in cheilinus; the lateral line is similarly interrupted,

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Parra, pl. iii. f. 1. Add *Lutjanus notatus*, Bl. 251. 2. *L. violaceus*, or *L. Linkii*, Bl. 252. *L. virescens*, Bl. 254. 1. *Lab. burgal*, Schœpf., or *L. chogset*, Mitch. iii. 2? *L. chrysops*, Bl. 248.

[1] The *Lutjanus viridens*, and the *L. Lamarckii*, Riss., first edition. In the second he adopts this subgenus, and adds to it a *Coricus rubescens*.

and, as in these and in labrus, there are two long conical teeth in front of each jaw, followed by smaller blunt ones: we have not had an opportunity of observing those in the pharynx.

But a single species is known, *Sparus insidiator*, P. Spic. Zool. Fasc. viii. pl. v. 1. of a reddish colour. From the Indian Ocean.

CLEPTICUS, *Cuv.*

A small cylindrical snout, which is suddenly protruded like that of an epibulus, but which is not as long as the head; the small teeth barely perceptible to the touch; the body oblong, head obtuse, and the lateral line continuous; the dorsal and anal enveloped by scales nearly to the summit of the spines.

C. genizara, Cuv., Parra, pl. xxi. f. 1. The only species known; of a purple red. From the Antilles.

GOMPHOSUS[1], *Lacép.* ELOPS, *Commers.*

Labroides, with an entirely smooth head, as in julis; but owing to the prolongation of the intermaxillaries and maxillaries, which are united by the teguments as far as the small opening of the mouth, the muzzle is made to resemble a long thin tube.

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[1] *Gomphosus viridis*, Cuv., or *G. Lacépède*, Quoy and Gaym., Voy. Freycin. Zool. pl. lv. f. 2. *G. cœruleus*, Lacép. iii. pl. v. f. 1., or *Acarauna longirostris*, Sevastianoff. Nov. Act. Petrop. xiii. t. xi. *G. variegatus*, Lacép. ib. f. 2.

Gomphosus is derived from γόμφος, cuneus, clavus.

They are taken in the Indian Ocean, and the flesh of certain species is held in the highest estimation[1].

XYRICHTHYS, *Cuv.*

These fishes resemble a labrus as to form, but are much compressed; the front descends suddenly towards the mouth in a trenchant and almost vertical line, formed by the æthmoid and the ascending branches of the intermaxillaries. Their body is covered with large scales; the lateral line is interrupted; the jaws are armed with a range of conical teeth, the central ones longest; the pharynx paved with hemispherical teeth; the intestinal canal is continuous, twice folded, without cœca, and has no cul-de-sac to the stomach: natatory bladder tolerably long. Up to our time naturalists had always placed them with the coryphænæ, from which they greatly differ both internally and externally. They approximate most to labrus, only differing in the profile of the head[2].

The greater number of xyrichthys have a naked head: such is

X. novacula; *Coryphæna novacula*, L., Rondel. 146.,

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[1] Renard, Poissons de la mer des Indes, part ii. pl. xii. f. 109. Commerson, however, tells us that the *cœruleus* is but indifferent food.

[2] The sharp edge of the head of the coryphænæ is owing to the interparietal crest; their scales are small and soft, their cœca numerous. See Mém. du Mus. ii. 324.

Salv. 117. (razor-fish.) Red, variously striped with blue. The flesh is esteemed[1].

Some of them have a scaly cheek[2]. Others are distinguished by small scales[3].

Chromis[4], *Cuv.*

The lips, protractile intermaxillaries, pharyngeals, dorsal filaments, and general appearance of a labrus; but the teeth of the pharynx and jaws resemble those of a card, and there is a range of conical ones in front. The vertical fins are filamentous, those of the belly being even frequently extended into long threads: the lateral line is interrupted; the stomach forms a cul-de-sac, but has no cœca.

C. vulgaris; *Sparus chromis*, L., Rondel. 152. The *Common* or *Black coracinus* of the ancients. A small chestnut-brown fish, taken by thousands in the Mediterranean.

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[1] The *Coryph. lineolata*, Rafin. Caratt. 33. does not differ from the *novacula*; but the *novacula coryphæna* of Risso is nothing more than the centrolophus. The *Coryph. cærulea*, Bl. 176. is a scarus. Add *Cor. psittacus*, L., *Cor. lineata*, L., and some new species.

[2] *Coryphæna pentadactyla*, Bl. 175., or *Blennius maculis* 5, &c. Ankarstrom, Stockh. Mem. pl. iii. f. 2. Linnæus has confounded it with the five-toed fish of Nieuhof. Willugh. App. pl. viii. f. 2., which is a mere pilot-fish, thereby inducing M. de Lacépède to make his genus *Hémiptéronote* of it, whose characters by no means correspond to this Xirichthys.

[3] *Rason l'écluse*, Quoy and Gaym. Voy. Freycin. Zool. pl. lxv. f. 1.

[4] Χρόμις, χρέμις, χρέμη, are Greek names of an unascertained fish.

C. niloticus ; Lab. niloticus, Hasselq. 346., Sonnini, pl. xxvii. f. 1. ; the *white* or *Egyptian coracinus* of the ancients. Found in the Nile ; it is two feet long, and is considered the best fish of Egypt [1].

CYCHLA, *Bl. Schn.*

Teeth small and crowded, forming a broad band, and differing from chromis in this as well as in the greater elongation of the body [2].

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[1] Add *Labrus punctatus,* Bl. 295. 1. *Labre filamenteux,* Lacép. III. xviii. 2. *Lab.* 15-*épines,* Id. ib. xxv. 1. *Sparus Surinamensis,* Bl. 277. 2. *Chætodon suratensis,* Bl. 217? *Perca bimaculata,* 310. 1.

[2] I strike out many species from the genus CYCHLA as constituted by Bloch, but I leave there, *C. saxatilis,* Bl. 309. *C. ocellaris,* Bl. Schn. pl. lxvi. *C. argus,* Valenc. App. Humb. Obs. Zool. tom. ii. p. 109. ; perhaps the *C. Brasiliensis,* Bl. 310. 2., and new species. But the *C. erythrura,* Bl. 261., and the *C. argyrea* are GERRES ; the *C. cuning* a CÆSIO ; the *C. brama* a CANTHARUS ; the *C. macrophthalma,* Bl. 268., the *C. Japonica,* Id. 277. 1., the *C. cynodon,* Id. 278. 1., belong to DENTEX ; the *C. Surinamensis,* Id. 277. 2., and the *C. bimaculata,* Id. 310. 1., to CHROMIS ; the *C. guttata,* Bl. 312., the *C. maculata,* Id. 313., the *C. punctata,* Id. 314., to SERRANUS, or, according to the system of Bloch, to BODIANUS. The *C. pelagica* is the CARANXOMORE of Lacép., or the *Coryphæna pelagica,* L. It is easily seen that Bloch was quite as unfortunate in the construction of his genus CYCHLA, as in that of GRAMMISTES.

The *Hiatulæ* would be labri without an anal fin ; but a single species, however, is quoted (from Carolina), and that merely from a

PLESIOPS, *Cuv.*

A chromis with a compressed head, approximated eyes, and extremely long ventrals.

MALACANTHUS, *Cuv.*

The general characters of a labrus, and similar maxillary teeth, but the pharyngeal teeth are like those of a card, as in chromis, &c.; the body is elongated, the lateral line continuous, and the operculum terminated by a small spine; the long dorsal has but a small number of spines; the anterior ones thin and flexible.

A species is found in the French Antilles, called by the inhabitants *Vive;* it is the *Coryphæne plumier,* Lacép. IV. viii. 1.: yellowish, irregularly and transversely streaked with violet; a crescent-shaped tail[1].

SCARUS, *Lin.*

A genus of fishes with remarkable jaws (that is, their

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note by Garden, which requires confirmation (*Labrus hiatula,* Lin.) It is not easy to imagine why Bloch, Schn. p. 481. placed it in *Trachypterus.*

[1] N.B. This figure, taken from Plumier, was altered by Bloch to represent his *Coryphæna Plumieri,* pl. clxxv. Lacépède gives a more exact one. It is also the *Matejuelo blanco* of Parra xiii. 1., or the *Sparus oblongus,* Bl. Schn. 283.

Add the *Tubleu* of the Isle of France, or *Labre large raie,* Lacép. III. xxviii. 2., the description of which is found, tome iv. p. 204., under the name of *Tænianote large raie.*

intermaxillary and premandibular bones,) which are convex, rounded, and furnished with teeth arranged like scales upon their edge, and upon their anterior surface; these teeth succeed each other from behind, forwards, so that those of the base are the newest, and in time form a row upon the edge: naturalists have erroneously thought that the bone itself was naked; besides, during the life of the fish, its jaws are covered by fleshy lips, but there is no double one adhering to the suborbital. They have the oblong form of a labrus, large scales, and an interrupted lateral line; they have three pharyngeal plates, two above, and one below, furnished with teeth, as in the labrus; but these teeth are transverse blades, and not rounded like paving stones.

A species blue or red, according to the season, is found in the Archipelago, which is the *Scarus creticus,* Aldrov. Pisc. p. 8., and which late researches have convinced me is the scarus, so highly celebrated among the ancients; the same that Elipertius Optatus, commander of a Roman fleet, during the reign of Claudius, went to Greece in search of, for the purpose of distributing it through the seas of Italy. It is an article of food in Greece at the present day. It is not the *Sc. cretensis,* Bl. 228.

Numerous species are found in the seas of hot climates. The form of their jaws and the splendour of their colours have caused them to receive the vulgar appellation of *Parrot-fishes.*

Some of them have the caudal crescent-shaped[1]; and a few of these have a singularly gibbous forehead[2]. In others it is truncated or cut squarely[3].

We separate from scarus the

Calliodon, *Cuv.*

Where the latter teeth of the upper jaw are separate and pointed, and where this jaw has an interior range of much smaller ones[4].

And the

Odax, *Cuv.*

Which approaches a true labrus in the inflated lips and continuous lateral line; the jaws composed like those of a scarus are, however, flat and not gibbous, and are covered by the lips; the pharyngeal teeth are like paving-stones, as in labrus[1].

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[1] *Scarus coccineus*, Bl. Schn., Parra xxviii. 2., which is the *Sparus Abildgardii*, Bl. 259., and the *Spare rougeor*, Lacép. III. xxxiii. 3.; the *Great scarus with blue jaws*, *Sc. guacamaia*, Cuv., Parra xxvi.; the *Sc. Catesby*, Lacép., Catesby II. xxix.; the *Sc. bridé*, Lacép. iv. 1, 2. *Sc. chrysopterus*, Bl. Schn. 57. *Sc. capitaneus*, Cuv., which is the *Sc. ennéacanthe*, Lacép. iv. p. 6.; and his *Sc. denticulé*, Id. p. 12. and pl. i. f. 1., and of which he gives a description annexed to the *Sc. chadri*.

[2] *Sc. loro*, Bl. Schn., Parra xxvii. 1. *Sc. cæruleus*, Bl. Schn., Parra xxvii. 2., and Catesb. II. xiii., which is also the *Coryphæna cærulea*, Bl. 176., and what is more extraordinary, the *Spare holocyanose*, Lacép. III. xxxiii. 2. and iv. p. 441. derives its origin from the same drawing of Plumier as this figure of Bloch.

[3] *Sc. vetula*, Bl. Schn., Parra xxviii. 1. *Sc. tæniopterus*, Desmarest. *Sc. chloris*, Parr. xxviii. 3. *Sc. psittacus*, Forsk. *Sc. viridis*, Bl.

[4] *Scarus spinidens*, Quoy and Gaym., Zool. Voy. Freycin. p. 289., and some new species.

The fifteenth and last family of the Acanthopterygii, or that of

FISTULARIDÆ.

Is characterized by a long tube in the fore part of the cranium, formed by the prolongation of the ethmoid, vomer, preopercula, interopercula, pterygoideals, and tympanals, and at the extremity of which is the mouth, composed, as usual, of the intermaxillaries, maxillaries, and the palatine and mandibulary bones. Their intestine has neither great inequalities nor many folds, and their ribs are short, or wanting.

Some of them, the *Fistulariæ,* have a cylindrical body; in others, the *Centrisci,* it is oval and compressed.

FISTULARIA, *Lin.*

The name of these fishes, in particular, is derived from the tube common to the whole family. The jaws are at its extremity, slightly cleft in nearly a horizontal direction. This head, thus elongated, constitutes the third or fourth of the total length of the body, which is itself long and thin. There are six or seven rays in the branchiæ, and some bony appendages extend, behind the head, upon the anterior part of the body, which they strengthen more or less.

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[1] *Scarus pullus*, Forst., Bl. Schn. 288.

The dorsal is opposite to the anal; the stomach, resembling a fleshy tube, is continued in a straight canal without duplicatures, to the commencement of which are attached two cœca. In

FISTULARIA (properly so called), *Lacép.*,

There is but a single dorsal, most of which, as well as the anal, is composed of simple rays. The intermaxillaries and the lower jaw are armed with small teeth. From between the two lobes of the caudal proceeds a filament which is sometimes as long as the body. The tube of the snout is very long and depressed, the natatory bladder excessively small, and the scales invisible. They are found in the seas of hot climates in both hemispheres[1].

In the

AULOSTOMUS[2], *Lacép.*

The dorsal is preceded by several free spines, and the jaws are without teeth; the very scaly and less slender body is widened and compressed between the dorsal and the anal, and followed by a short and very small tail, terminated by a common fin. The tube of the snout is shorter, thicker, and compressed; natatory bladder very large.

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[1] *Fistularia tabacaria*, Bl. 387. 1. *Fist. serrata*, Id. ib. 2. are from America, Marcgr. 148., Catesb. II. xvii. *Fist. immaculata*, Commers., J. White, p. 296. f. 2., is from the Indian Ocean.

[2] *Aulostomus* (flute-mouthed), *αὐλὸς* and *στόμα*.

But a single species is known; from the Indian Ocean[1].

CENTRISCUS, *Lin.*

In addition to the tubular snout of the family, they have a body not elongated, but oval or oblong, compressed on the sides, and trenchant underneath; gills consisting of but two or three slender rays; a first dorsal spinous, and small ventrals behind the pectorals. The mouth is very small, and cleft obliquely; the intestine without cœca, doubled three or four times, and the natatory bladder considerable. In

CENTRISCUS, (properly so called,)

The anterior dorsal, situated very much behind, has its first spine long and stout, supported by an apparatus connected with the head and shoulder. They are covered with small scales, and have, besides, some broad and denticulated plates on the apparatus just mentioned.

C. scolopax, L. Bl. 123. (*Sea-snipe.*) A very common species in the Mediterranean, but a few inches long, and of a silvery colour. It is also the *Silurus cornutus,* Forsk., the *Macroramphose,* Lacép.

AMPHISILE, *Klein.*

The back mailed with broad scaly plates, of which the anterior spine of the first dorsal seems to be a continuation.

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[1] *Fistularia chinensis,* Bl. 388.

Some of them even have other scaly plates on the flanks, and the spine in question placed so far behind that it thrusts the second dorsal and anal towards the latter part of the tail. Such is the *Centriscus scutatus*, L., Bl. 123. 2.

Others are intermediate between this disposition and that of a common centriscus. Their cuirass covers but half the back, *Centriscus velitaris*, Pall. Spic. VIII. iv. 8.

Both these species are from the Indian Ocean.

SUPPLEMENT

ON THE

FIRST ORDER OF FISH.

ACANTHOPTERYGII.

The organic characters of this very extensive order of fishes have been briefly, but sufficiently indicated in the text. We may however repeat, that it was established by Artedi, the Swedish Ichthyologist, after the suggestion of our countrymen Ray and Willughby, and includes fishes that are apodal, jugular, thoracic, and abdominal, with ample gills, and whose fins are more or less armed with stiff simple pointed bones or spines.

As this order includes so large a proportion of the class, our supplementary observations to the Baron's labours upon it shall be divided and distributed in proportions to each of the families. We confine ourselves, therefore, at present, to the first family of this order, namely

Percoides, or such acanthopterygian fishes, as in the words of the text, have an oblong body covered with scales, which are generally hard or rough, the operculum or the preoperculum, and often both, with the edges denticulaed or spiny, and the jaws, the front of the vomer, and nearly always the palatine, furnished with teeth.

The common perch *(Perca fluviatilis)*, the type of the first genus of this family is known to most persons, either for the amusement it affords while alive, or the savoury quality of it as food when dead; like most, however, of the commonest objects of nature, its history, organization, and habits, arrest the attention only of the inquisitive few.

A general description of this common fish may be needless, but we may observe with reference to such points of its structure as are less obvious than others, that the whole series of teeth are small and pointed, as well those of the jaws as of the palate and gullet; the tongue is smooth; there are two orifices to each nostril, surrounded with three or four large pores, destined apparently to give vent to a viscous secretion; the preoperculum is denticulated and prickled; the operculum terminates in a sharp process, covered with little scales less adherent than those of the body and tail; the first dorsal fin is longer than the second.

The perch is found throughout nearly the whole of Europe, especially toward the sources of the greater rivers, and in the lakes; but it is in Russia, particularly the rivers and lakes of Siberia, that it most abounds, and attains the largest size; the perch of Southern Europe seldom exceeds two feet in length, and four or five pounds in weight; but in Russia and the north generally, they grow much larger; one is said to have been caught in the Serpentine river, in Hyde Park, which weighed nine pounds; and Bloch states that the head of one is preserved in a Church of Lapland, about a foot in length.

The perch swims with great rapidity, and as well as the pike, generally near the surface. The female lays her spawn when three years of age, in the spring, and it is said that she rubs herself against rushes and hard bodies, to facilitate its exclusion. The eggs are linked together, forming a sort of chaplet like that of the spawn of frogs and toads, four or five being inclosed in one common membrane, giving to the mass the appearance of hexagonal meshes; each egg is about the size of a poppy-seed, but they vary greatly in number. Harmer, Bloch, and Gmelin state, that there are about 300,000 in a perch of half a pound weight. Picot has counted 992,000 in a fish weighing about a pound; and Rousseau the elder found only 69,216 in another of nearly the like weight.

The perch is eminently predatory, devouring with avidity the young and the weak of most animals of its class, as well as water-lizards, frogs, small snakes, aquatic insects, worms, naked mollusca, &c. They may be seen in summer springing from the surface of the water, in pursuit of gnats and flies; indeed, so voracious are they at times, that they will precipitate themselves on animals, whose means of defence are too effectual for them; and thus they have been found dead, apparently of hunger, with a stickleback in the mouth, whose dorsal spine was stuck through the palate of the perch. It is not, however, in its turn, without powerful enemies, notwithstanding the formidable character of its dorsal spines; as it frequently falls a prey to pike, large eels, and trout, as well as to the web-footed and wading birds. A small crustaceous animal also, *cymothoë*, insinuating itself into the delicate tissue of the gills, destroys many of them. When the water, moreover, is frozen for a time, they become swollen, and the mucous membrane which covers the cavity of the mouth, and another over the extremity of the rectum, enlarge and form bags, and unless air be admitted, they soon perish. At this time they may be taken even with the hand, if a hole be made in the ice, to which they will repair with eagerness. Some have a deformed flexure of the spine, giving the fish a hump on the back. These Linnæus found in Sweden, and Pennant in some of the waters of Merionethshire, which abound also with ordinary perch; they must be considered, therefore, rather as an established variety than as morbid individuals. Nilsson, (*Prod. Ichth. Scan.*) speaks of them under the title *Varietas gibba.*

The Basse, *P. labrax*, of Lin., *Labrax lupus*, Cuv., is found on our coast, but much more abundantly in the Mediterranean, and was well known and highly esteemed as a delicacy by the ancients. It attains considerable size, and sometimes weighs thirty pounds, and is extremely bold and voracious; whence its ancient name of the wolf, by which the Romans designated it. In accordance with the conformity of character and impulses with the structure of animals, a conformity always the more apparent in proportion to the extent of investigation, it has been observed, that the extraordinary voracity of this fish is attributable to the great extent of the stomach, and to the large size of the liver, and biliary vessels.

It generally inhabits the sea, but near to the mouths of great rivers, which it seldom ascends, and deposits its spawn near the shore. Pliny and Ovid have celebrated the voracity and the culinary excellence of this fish.

The Variole, *Perca nilotica*, of Lin., *Lates niloticus*, of Cuv., is the largest of the fish inhabitants of the celebrated Nile; and if we can credit the statement of Paul Lucas, has been seen of the weight of 300 pounds. Individuals of a very large size, however, are found only in Upper Egypt. It appears, according to Geoffroy, to be the λατος of the Greeks, and was sacred at Latopolis, where the use of it as food was forbidden. It is said also, on the authority of Gmelin, to be found in the Caspian Sea; but the slightest attention to his description, and the figure which he gives, would have sufficed to show that the fish to which he gave this name was in fact a goby.

In pursuing the various subdivisions of this family, founded entirely on structure, it cannot be expected that many species will occur, whose particular habits might demand attention, especially when it is considered that the habits of few only of these are known, and that very imperfectly. How vast a portion of the economy of nature goes on totally unheeded by us, and how much more of it proceeds absolutely hidden from our most industrious researches? We need not contemplate the depths of ocean alone as hiding from our view a host of wonders and beauties, while the limited powers of locomotion we possess, confine us in a great degree to a commensurately limited view of things, even in the medium which we inhabit. In running, therefore, through the list of the present class, it is only an occasional species here and there, which will afford what may be called a biographical notice.

The Pike-perch, *Perca lucio-perca*, Lin., *Lucio-perca sandra*, Cuv., which attains the length of three or four feet, and is sometimes found of the weight of twenty pounds in Northern Europe, and Asia, and especially in the Danube, and the lakes of Saxony. It generally remains at the bottom of the deepest waters, seldom approaching the surface. Like the pike in the shape of the body, but more like the perch in the arrangement of the dorsal fins, the roughness of the scales, and the indentations of the opercula, it has received a name (lucio-perca[1]) applicable to its partial similarity to these two species.

This fish is greatly prized, and the taking it is followed very ardently in the north, either by nets or lines. It quickly dies when taken from the water, and also, as it is said, when

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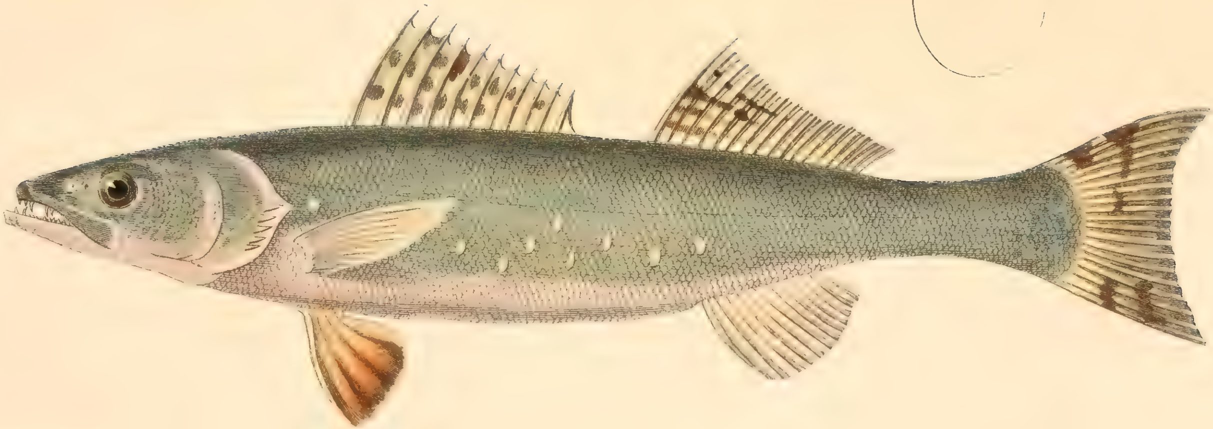
[1] *Esox Lucius,* pike, and *Perca fluviatilis,* perch.



Lucioperca Canadensis. Ham Smith _ Green Pickering.

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put into a vessel filled with water taken elsewhere, than from the lake or river in which it may happen to be caught. Its flesh is white, tender, and easy of digestion, and is often transported considerable distances, wrapped in herbs or snow.

Its growth is very rapid, where there is no want of food; but it requires a great number of small fish, which it devours with great avidity, sometimes, when adult, attacking small perch and pike, though, when young, it frequently falls a prey itself to those ravenous marauders. The plunging water-fowl destroy many of them, and pursue them even to the very depths of their favourite retreat. In warm weather, toward the middle of spring, they quit the deep water, and deposit their spawn on substances which they may find near the bank, so that it may feel the vivifying influence of the sun.

Our figure of the *Luc. Canadensis* is by Colonel Smith, from a specimen drawn by him in Canada, where it is common, and known as the green pickering. The spots on the sides are yellowish white; those on the fins are nearly black.

Of the numerous species of the genus serranus of the text, and of its several subgenera, the Mediterranean barber [1], *Anthias sacer*, of thé text, is the most remarkable, and that for its splendour and beauty. This fish, which is ordinarily seven or eight inches long, inhabits the Mediterranean, and feeds principally on small crustacea. Its history is much confused. Rondelet, the first describer of it, seems gratuitously to have considered it as the *Anthias* of the ancients; and that notion was adopted by the Ichthyologists of the sixteenth and seventeenth centuries. Artedi, and after him, Linnæus, referred it to the genus *Labrus*, the latter with anthias, as a specific addition associating it with an American fish, described by Catesby, very different from the anthias of Rondelet. Lacépède refers it to *Lutjanus*, and Shaw to *Sparus*. T. Delaroche describes an individual taken near Iviça, at a depth of seventy fathoms, which was the only specimen the fishermen who took it had ever met with. Nothing is known of its habits; and Bloch was not warranted in attributing to it all that the ancients have said of their anthias, or that it was gregarious, deposited its spawn in summer, drove the voracious fish from the place of its residence, and was, therefore, called the sacred fish, an epithet applied by the Greeks to many species, without any very obvious reason. Their anthias was found only on the coast of Pamphylia, in Asia, where it was the object of a particular fishery, which Pliny has described with circumstances which denote the facility with which the tales of the fishermen found credit with him.

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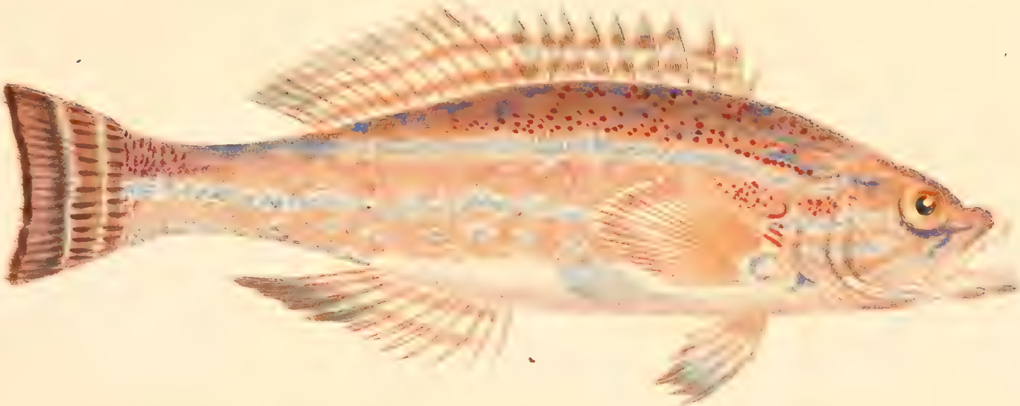
[1] So called from the third dorsal spine, and its fleshy appendage, presei [illegible] some remote or fancied resemblance to an open razor.

This fish is described as being covered with all varieties and shades of red of the most brilliant hue.

Colonel H. Smith has figured an undescribed serranus (*sarnicus*), which we have copied. It is red, lined and dotted with purple.

Among the jugular percoides we may notice *Trachinus Draco* of Lin., the weaver of our own country, the sea dragon of Pliny, and many others. This fish inhabits the British Channel and the Mediterranean, embedded in the mud or sand, in which it digs a retreat, especially towards the end of spring, at which period it casts its spawn also.

Fishing for this brilliant and beautiful fish is not without risk; and as the fancied beings of mythology frequently connected the greatest beauty with the utmost malevolence, the ancients, finding these qualities associated in the fish in question, named it the sea-dragon. The extent, however, of its power of mischief consists in inflicting a severe wound with the spines of the first dorsal fin, which, nevertheless, are not



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venomous, as has been asserted by Pliny and a host of his followers. Such, however, is the fear inspired by this fish, that by a police regulation in France the fishermen are directed to cut off these spines before they expose the fish for sale.

Mullus barbatus, Lin. The Red Mullet has for ages had the misfortune, by its personal beauty and the savory quality of its flesh, to excite some of the worst passions of man's degenerate nature. It stands pre-eminent in the annals of human luxury, cruelty, and folly.

This fish has always been very abundant in the Mediterranean, though it is found also on all the coasts of Europe, and is, as every one knows, by no means uncommon in the London market, especially about the mackerel season. It feeds on crustacea and on dead animals of almost all kinds, and brings forth three times in the year.

The great and rich among the Romans were in the habit, according to Varro, of preserving the red mullet in artificial waters, as one of the most convincing proofs of their individual wealth. Cicero has ridiculed the senseless ostentation with which they exhibited fine specimens of this fish, domiciliated in their own ponds; but Seneca and Pliny have rendered their countrymen odious in the eyes of posterity, and of other nations, by relating the cruelty with which in their disgusting orgies they revelled over the dying mullet, while the bright red colour of its healthy state passed through various shades of purple, violet, bluish, and white, as life gradually receded, till the convulsions of death put an end to the *pleasing* spectacle. They had these devoted fish enclosed in water in vessels with sides of crystal, over a slow fire on their tables, and derived a fiend-like pleasure from the lingering sufferings of their victims as the increasing heat of the water gradually destroyed them, before the final operation of boiling had rendered them fit to gratify the refined taste of civilization. One cannot, indeed, read these revolting histories of old time without a blush at certain modern practices far too analogous with them; the sense of taste may in the cases alluded to be alone consulted, but the difference is nothing to the suffering animal whether its torments gratify one or more of the evil passions of its tormentors. The skinning of eels and the boiling of live crustacea would be as disgusting as the gradual boiling of a mullet, did not in this, as in many other cases, the practice of evil destroy the feeling of its iniquity.

So extravagant was the folly of the Romans with regard to this fish that they often gave for them immense prices. Martial mentions one of four pounds weight, which had cost 1300 sesterces; and it is said that the emperor Tiberius sold one, weighing nearly five pounds, for 4000 sesterces. Asinius Celer, one of the consuls, is reported by Pliny to have paid 8000; and, according to Suetonius, 30,000 sesterces had been given for three mullets.

The surmulet, or striped mullet, *Mullus surmuletus*, Lin., is found more abundantly than the red, and is not confined to the coasts of Europe, having been found in vast numbers on the southernmost parts of South America, and latterly a little south of New York: it is sometimes caught weighing seven pounds. It feeds like the red mullet, but is remarkable for giving out at times a strong and disagreeable odour. This species was consecrated by the Romans to Diana, as goddess of the chase, because, as they thought, it pursued and attacked dangerous fish: they live gregariously, and quit the depths of the sea, to deposit their eggs about the mouths of rivers, three times in the year. They are good eating, but are not so highly prized as the other species.

Of the second family of this order whose cheeks are armed, the first genus is trigla, the gurnard, of which *T. pini* of Bloch, the red gurnard, is frequently seen in our markets, and is found in all the European seas, from twelve to fifteen inches long. It is extremely voracious, but feeds principally on the crustacea, and comes into shoal water in the months of May and June to deposit its eggs. Though this fish is not much esteemed by epicures it is nevertheless good eating, and is considered easy of digestion.

T. lyra, belonging to this genus, is described in the text. It is called the piper, in consequence of a sort of hissing it makes by the expulsion of the air through the gills when taken.

T. hirundo, called also the *tub-fish*, and by Pennant the *Sapphirine gurnard*, is found in the North Sea, and occasionally in the Baltic and the Mediterranean, and also about the Cape of Good Hope and the coasts of Southern Africa. It swims very rapidly, and inhabits at great depths of water the greater part of the year. Its flesh is hard and little esteemed, though it is salted for ships' provisions in the north. The older naturalists have called it the sea crow, from a noise emitted by it on being taken, which fancy has assimilated to that of the crow.

Another species, *T. lucerna*, is so named from its shining property in the dark. The grey gurnard, *T. gurnardus*, is still more common on our coast than the red: it sometimes attains three feet in length, and seems to have habits similar to those of the red.

The celebrated flying fish[1], *T. volitans*, Lin., whose appearance above the surface of the water furnishes an event to break the monotony of a long voyage, especially to mere passengers, is found in almost all the intertropical seas, and abounds also in the Mediterranean.

The distinguishing characters which have induced its separation from the Linnæan genus trigla, are noticed in their proper place; and we shall not refer to them here, except to observe that the pectoral fins, by means of which they make their aërial excursions, are as long or longer than the body, and are supported by articulated rays, something like those of the wing of a bat. It is by this extension of the pectoral rays and membrane that the fish is enabled to raise itself from its proper element to the regions of air, though this is by no means a continued flight, for the utmost it can do is to describe an arch over the surface of the water extending to a distance of about 120 feet, and sufficiently elevated for the fish sometimes to fall on the deck of a large vessel. This power of flight or momentary suspension would be much greater if the pectoral membrane could preserve its humidity longer; this is soon evaporated in the heat of the tropics, and the membrane, as it becomes dry, loses its buoyant power, and the fish falls.

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[1] This name is applied to other species, as, for instance, the *Exocœtus mesogaster*, one of the *Malacopterygii abdominales*.

These fish are sometimes so numerous as to afford much pleasure to the spectator by their repeated flights, and at particular times, especially on the approach of rough weather in the night, numbers of them may be seen, by the phosphoric light they emit, marking their arched passages in apparent streams of fire. It is not, however, for their own pleasure or amusement that they thus quit their natural element. But few animals seem to be more beset by enemies than the flying fish: pursued by many fish, especially those of the genera coryphæna and scomber, they seek refuge in their temporary flight; but if they thus escape these enemies, they frequently fall a victim to the sea birds, which are hovering over to pounce upon them.

They feed on mollusca, naked and shelled, and on crustacea, whose covering they break by means of their obtuse teeth. They are eaten, but are not much esteemed.

The cotti, *C. Gobio,* the miller's thumb, or river bullhead, is common in almost all the rivers and streams of Europe and Northern Asia which have a stony or sandy bed. It remains concealed under a stone, or in a little hole, whence it darts with wonderful rapidity on its prey, consisting of the fry of small fish, worms, and aquatic insects: it is said that its voracity does not spare the young of its own species, though in its turn it becomes the prey of pike, perch, salmon, &c.

This species is very prolific: the female, when in spawn, appears greatly swollen, and the protuberances formed by the two ovaries at this time are so elevated and rounded as to be comparable to the mammæ; and as there is but one step from a comparison to an absurd hypothesis, it has been said that the female bullhead sat on her eggs, and would be killed rather than be induced to leave them. The bullhead, like the salmon, turns red on being boiled; and it is good and wholesome eating.

The salt-water congener of the last species, the Father-lasher, *C. scorpius*, is an inhabitant of the Atlantic, and is an extremely voracious, bold, and active fish. As found on our coast it seldom exceeds nine or ten inches in length. A story of Pontoppidan's, a misconception of Bloch's, and a mistranslation of Lacépède's have caused it to be represented as reaching six, and even ten feet, in the Northern Seas. It is not generally eaten, but the hardy Greenlanders feed on it. In Norway an oil is extracted from its liver.

In the genus scorpæna, which, from its unsightly appearance and fancied dangerous qualities, has received the names of scorpion, toad, sea-devil, &c., the *S. scropha*, or larger red scorpion, is found, in sufficient abundance, in the Atlantic Ocean, the North Sea, and the Mediterranean, and attains a length of eighteen inches, or even two feet. Its flesh is poor and dry, though it is sometimes eaten by the poor in the south of Europe. The Norwegians will not eat it, but they extract oil from its liver.

S. porcus is a smaller species, not exceeding eight or ten inches. It is found in the same localities as the other, and lies in ambush under fuci and other marine plants, to dart on its unsuspecting prey. The forbidding appearance of these fish accords with their predatory and voracious habits.

In the genus PTEROIS of Cuv. occurs the scorpæna volitans of Gm., &c., which has pectoral fins larger than the body, and like those of the ordinary flying fish, except that they are feebler, and so deeply notched, that they appear incapable of raising the fish out of the water. The fishermen of Ceylon, where this fish abounds, assured Mr. Bennett that they never had seen it fly.

Among the great number of extraordinary fish which live in the North Pacific Ocean, on the coasts of Kamtschatka, of the Aleutian Islands, of the land of Jesso, and towards the islands south of Japan, there are few more singular than the genus typical species BLEPSIAS.

Steller made a blennius of this fish, although its ventral fins have four and perhaps five rays. Pallas would have arranged it among the trachini; but assuredly it presents no title to belong to that genus, for it has neither opercular spine nor jugular ventrals, nor the first dorsal spine so small and so dangerous. Its spiny preoperculum, its compressed head, its mailed cheek, its palatine teeth, the simple, short, and half separated rays of the lower part of its large pectorals, the fleshy shreds which depend from its muzzle, approximate it, on the contrary, to the scorpænæ. But from the scorpænæ themselves it is distinguished by the five rays of its branchiostegous membrane, and by its high dorsal fin, divided into three unequal lobes, like that of the hemitriptera, while its compressed head separates it from this latter genus.

Nothing, therefore, was so simple and necessary as to form a particular genus of it. Since by its forms it is isolated from the rest of nature, it should therefore be isolated in a method, whose best claim to attention should be to represent the productions of that nature in their true relations.

The name of *Blepsias*, given by M. Cuvier, is one of the very many left us by the ancients, without any mark whereby their application can be fixed.

Of the habits of this genus nothing very particular can be remarked.

The *apistus* is analogous to scorpæna in the undivided dorsal fin and the palatine teeth; but the pectoral rays, much less numerous, are all branched. The long spine on the suborbital, and another at the preoperculum, by the mobility of the bones to which they appertain, become, when they are inclined from the cheek, weapons of offence, of which these fish make use at the moment when it is least expected, and they are so much the more dangerous, as they can scarcely be perceived when in a state of repose. From this circumstance their generic name is derived, *απιστος* (perfidious.)

The apistus Israelitorum flies like the dactylopteri and the prionoti. M. Ehrenberg has observed it near Tor, and every time that the sea was agitated some of them fell into his vessel. As it is the only flying fish of the Red Sea, and is particularly abundant on that coast of the desert where the Israelites wandered for so many years, this learned traveller conceived that what we read in Exodus concerning the quails, by which for a certain period that people were fed, was applicable to this fish. If this be the case, the interpreters must have translated by the word quail, a Hebrew word, which originally had a sense totally different.

The Arabs name it *gherad el bahr*, which signifies *sea-locust*.

The *Apistus fusco-virens*, observed and depicted in Amboyna by MM. Quoy and Gaymard, is supposed in that country to inflict very dangerous wounds, which is attributed, but erroneously without doubt, to a sort of poison with which the skin that covers the spine is invested.

Naturalists who refuse to establish new genera when they find beings to which the characters of the old genera will not apply, expose themselves to an arbitrary allocation of these new beings, and to see it contested and altered by their successors. These species are thus handed from genus to genus, until the laws of reason shall be obeyed, and the animals are separated in the method which is in conformity with nature. Besides, it always happens in the end, that to these isolated species some congener is found, thus removing the scruples which might have been made to forming a genus with a single species.

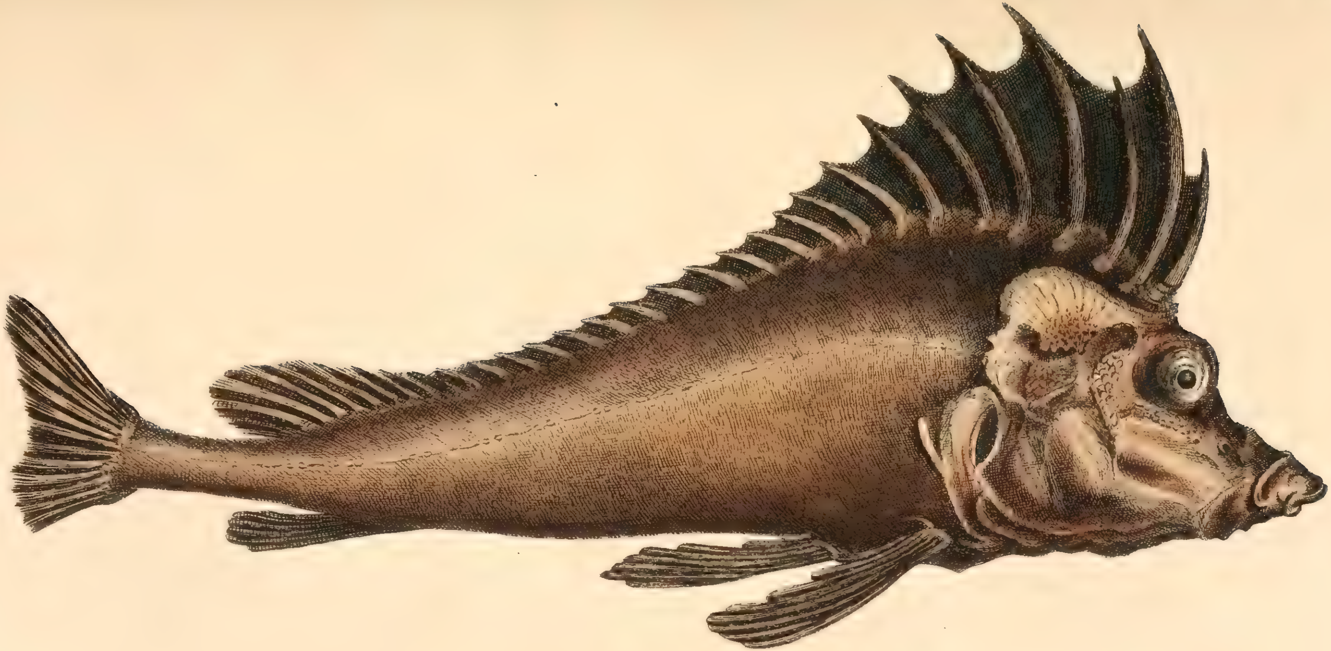
The fish which serves as a type to AGRIOPUS (*torvus*) is an example of this. Gronovius made it a *blennius*, and it was again placed with that genus by Walbaun, who confessed, however, that properly speaking, it did not belong to it, and might very well be placed elsewhere. In fact, it was impossible to admit that a blennius could be so well armed, and have the ventrals under the pectorals, and supported by six perfectly complete rays. Our figure of this species is from the British Museum.

Bloch, in his *Systema*, makes it a *coryphæna*, and this without the least hesitation, although he himself has indicated as one of the characters of the coryphæna the scales which should cover their cheek.

Gronovius tells us that this agriopus belongs to the Indian Ocean; but its true country is the Cape of Good Hope: M. Lichtenstein assures us that he has seen it there very often. It is singular enough, that being found in latitudes so much frequented, and being in itself so remarkable, it should have been so little known to naturalists.

The Dutch at the Cape called it seepaard (sea-horse), and use it as food.

In this family, with scaly cheeks, so abundant in fishes of peculiar form, and among the genera allied to the scor-



Agriopes Torvus.

[illegible] Ave Maria Lane [illegible]

pænæ, which are almost all remarkable for their ugliness, there exists one more deformed, and we may say more monstrous than all the rest: this is the genus Pelor, of which Pallas has described a species under the name of *Scorpæna didactyla.* Its head crushed in front, its projecting and approximating eyes, the high and almost isolated spines of its dorsal, cause it to be distinguished at the first aspect. To these unusual forms are united certain precise characters; the absence of the scales in the body, that of teeth to the palatines, and two free rays under the pectorals.

The *Pelor filamentosum* seems a new species brought from the Isle of France; without the assistance of a figure it would be impossible to communicate an idea of the inconceivable oddity of the forms with which nature has thought proper to mark this extraordinary fish. It lives upon crustacea. The debris of Squillæ have been found in its stomach.

Bloch, in his *Systema*, has detached the genus *synanceia* from that of scorpænæ, and indeed it was impossible to suffer them to remain confounded. The synanceia have no spines to the head, and the head is not more compressed than in many of the cotti. The vomer and palate are deficient of teeth, and the pectorals, though pretty nearly of the same form as those of the scorpænæ, have only branched rays. They also far exceed all the scorpænæ in their hideous forms and disgusting skin. The pelora alone can dispute precedence with them in these particulars. All the known species likewise come from the Oriental Seas.

As to the species *horrida*, it is difficult for language to convey an idea of so anomalous a being, and even to conceive it by means of drawing, it would be necessary to represent it in all its faces. On the whole, however, what occasions it to differ so much in appearance from the neighbouring species, is that the interval of the eyes is projecting instead of being hollow, and that the great suborbital diverges widely from the eye, which leaves between the eye and the bones a large and deep foss, something of which is already perceptible in pelor.

This species seems to be rare, and its habitation generally is the various parts of the Indian Ocean.

The *Synanceia brachio* is called by the Negroes of the Isle of France *fi-fi*, or the *hideous*, and they hold it in the utmost horror. In fact, nothing can be more frightful: one would scarcely call it a fish, but a mass, an unformed lump of corrupted jelly. *Totum corpus*, says Commerson, *muco squalidum et quasi ulcerosum.* Its head and limbs are enveloped as it were in a sack, by a thick skin, soft, spongy, altogether wrinkled and verrucose, like that of a leper, variegated without any order, by little clouds of whitish, grey, brown, and divers other tints; sometimes it appears entirely black; but it is always gluey and disagreeable to the touch. It scarcely suffers the little eyes to appear upon the huge or cavernous head. The dorsal appears to be rather a series of small tubercles than a fin. The broad and short pectorals appear intended to surround the neck like a frill, rather than to serve as organs of natation. This ugly fish possesses very great tenacity of life, and can subsist for a long time out of the water. The skin, like that of pelor, can form in the upper part of the gills, above the point of the operculum, a little ring, which remains open independently of the gill itself; so that the fish, when it pleases, respires through that, leaving the rest of its branchial operculum closed, and consequently without exposing its gills to desiccation.

The inhabitants of the Isle of France regard it rather as a sort of reptile than a fish, and the fishermen dread its sting more than that of the viper or the scorpion. There is reason, however, to believe that the wounds which it inflicts are not of themselves more envenomed than those of other fishes of the same family, and that the accidents which are consequent upon them proceed from the depth to which the slender and pointed rays may penetrate, and at the most to the mucosity with which they are invested, and which they cause to sink into the wound, where its ravages will be in proportion to the heat of the climate.

This species inhabits all the warm parts of the Indian and Pacific Ocean.

The MONOCENTRIS of Bloch, or the LEPISACANTHUS of Lacépède, has not only the cheek mailed, but the entire of the body. In this respect, it resembles peristedion with which, otherwise, it has no points of similarity in conformation. One would rather be tempted, with Thunberg, to compare it with Sciæna, in consequence of the gibbous form of its cranium, and of its two dorsals. But, independently of its armature, its eight branchial rays, and palatine teeth, are sufficient to show that it does not belong to that genus. Houttuyn had ranged it among the gasterostei, and it must be allowed, that it possesses their large spines to the ventrals, the first dorsal being replaced by free spines, and that many gasterostei are also partly mailed. But the gasterostei have but three rays to the gills, and the form of their head is totally different.

This fish has hitherto been found only in the seas of Japan.

The GASTEROSTEI are the smallest of our fresh water fish, and also pretty nearly the most common.

There is not a stream or pond in which some of them are not to be seen, and which does not even swarm with them at certain seasons. The form of their head has nothing peculiar, and one can scarcely at first imagine that they possess the mailed cheek, for the suborbital which covers it is smooth, and is not distinguished under the skin. Nevertheless, its position, and the space which it covers, are the same as in trigla, and the other genera of this family.

The French name of this fish *(epinoche)*, ours (stickleback), and those which it receives in most of the European languages, are sufficiently explained by the spines with which the back is armed, as well as by those which assume the place of ventral fins.

That of *Gasterosteus*, which has been imposed upon them by Artedi, is intended to express the osseous cuirass, with which the under part of their belly is furnished, and which is formed by the bones of the pelvis, and a part of those of the shoulder, larger, more thick, and less concealed by the teguments, than in many other fishes.

To the species which unite to these characters of an armed belly, of spiny and free rays on the back, and of ventrals pretty nearly reduced to a single skin, that of three rays only to the gills, Artedi and M. Cuvier limit the genus of the stickle-backs. They remove from it a great number of others, which have not each and all of these different characters.

The *stickle-back with naked tail*, and *that with armed tail*. G. *leiurus*, et G. *trachurus*, Cuv. G. *aculeatus*, Lin. These, the largest of the kind of which naturalists have hitherto made but one species, under the name of *aculeatus*, may very well comprehend two very distinct ones, and even more; but as these differences have not been remarked, it is difficult to discern in their history, what properly belongs to one or to the other.

Some of these are to be found every where, where there is any stream, marsh, or pool of water. They are included in the Faunæ of every European country, and under a variety of names, with which we shall not tire the ears or patience of our readers. They should even exist as far as Greenland, if it be true, indeed, that Fabricius saw there the same species, and not some one of those of America. Gesner alone says, that there are none in Switzerland, but the reverse is known to be the fact.

Pennant informs us, that in the fens of Lincolnshire these little fishes abound more particularly than elsewhere; and that at Spalding, they appear from time to time (once in seven or eight years) in surprising quantities, and ascend in thick columns the river Welland on which this town is situated.

Their extreme multiplication is rather astonishing, for the eggs of the stickle-backs are big, and they cannot lay many of them. It is true, on the other hand, that they have but little to dread from other fishes, seeing that they are defended against them by sharp and strong spines; but they have internal and external enemies which unceasingly torment them; for instance, a species of binoculus, which attaches itself to their skin, and sucks the blood; and the *bothriocephalus solidus,* a species of the family of *tænia,* which sometimes fills almost the whole abdomen, compressing their intestines, and reducing them to a very small space. They can subsist a tolerably long time out of the water, especially when they fall into the humid grass.

Bloch assures us that they live but three years, and his assertion has not been controverted by facts. They are extremely agile fish, lively in their movements, and of an active disposition. Henry Backer tells us that they leap vertically out of the water, to more than the height of a foot, and that in an oblique direction they can make springs still more considerable, when they are obliged to pass above stones or other obstacles. Their voracity is excessive. Backer has seen a stickle-back devour in the course of five hours, seventy-four new-born fish, of the species of the *vandosia,* each of which was three lines in length. Accordingly no fish does more injury to ponds than the stickle-backs; and it is so much the more annoying to see them introduce themselves there, as it is extremely difficult to extirpate them. As aliment they are but little esteemed.

Theophrastus speaks of a little fish of Heraclea, on the Lycus in Bithynia, which he names *centriscus,* and which was absurdly numbered among those which spring spontaneously from corruption. This name *centriscus*, which has relation to needles or spines (κεντρον), its diminutive termination, which indicates a small size, its habitation in the fresh water, and finally, this fabulous origin, which many writers of the middle ages have attributed to our stickle-back, have caused it to be believed, that the latter might probably be the centriscus; and Klein has, consequently, determined to give the name of *centriscus* to the genus.

M. Cuvier positively declares, that in the waters of France there are two sorts of stickle-backs with three rays. To follow him through his long and minute description of these, would be quite beyond our present purpose. The species which Linnæus calls *pungitius* is one-third smaller than the common stickle-back, and there dwells no fish on the coasts of our sea of such small dimensions. It scarcely weighs half an ounce. The dwarf *Atherina* of Risso, is alone below this size, if, indeed, it be not the young of a larger species.

There are many of the smaller stickle-backs in the streams of England. Ray particularly mentions those of the county of Warwick. In general the species is not less spread in Europe, than that with three spines. It appears, that it is also found in the salt water; but the denomination given it by Bloch of *small sea stickle-back*, is not the less improper. The vulgar names are generally the same as those of the large stickle-back, with some epithet which marks its smallness. The Russians name it *Kolinska.*

The *oreosoma* is another of the strangely figured beings which might rather be taken for the monstrous production of a morbid imagination than for a reality existing in nature. Let us represent to ourselves a small fish, as high as broad, bristling with thick cones like sugar-loaves, and we may begin to form some notion of the *oreosoma*, or mountainous fish; for this is the signification of its name (from σωμα, a body, and ορος, a mountain,) and it merits the denomination from the thick swellings, the drawing of which has the appearance of the map of a volcanic country.

It has been impossible to discover any thing approximating to it in the account of naturalists, or travellers, who have spoken of fish. We are indebted for it to the indefatigable attention of Peron, which was engaged on the minutest objects. He brought it from the Atlantic Ocean, and his specimen did not exceed sixteen lines in length.

We now come to the great family of the SCIÆNOIDES.

We find in this family pretty nearly all the external characters of the percoïdes; but we shall not enlarge here on the character as stated in the text.

The family of the mailed cheeks, if we except the peculiar disposition of the infra-orbitals, establishes a sort of passage from the percoïdes to the sciænoïdes. A part of its genera, the scorpænæ more especially, are connected with the percoïdes by their palatine teeth, and the sebastes so much resemble the serrani, that they are frequently confounded with them, while others of the mailed cheeks, the synanceæ, for example, have the palate also as smooth as any of the sciænoïdes.

The sciænoïdes also resemble the percoïdes in many details of their internal parts; but we observe more varieties, and especially, more complicated structures in their natatory bladders. A great many have horns there, still more developed than those of the trigla; and though these natatory bladders appear to have no communication with the exterior, as all the sciænoïdes send forth noises still more marked than those of trigla, it is difficult to believe that the disposition of these organs should not have some relation with this property.

The sciænoïdes are scarcely less numerous than the percoïdes, either in genera, or in species. They have pretty nearly the same habits, and present the same utilities to man.

Almost all their species are good for eating. Many are of an exquisite flavour, and there are some which arrive to a size equal, if not superior, to that of the largest percoïdes. The sciæna, for instance, of the European seas, becomes as large as the variolæ of the Nile and of the Ganges, or as the largest polynemi, and many of the Johnius surpass our bass and centropomi.

The Mediterranean possesses three remarkable fishes of this family; the *sciæna* (or maigre), the *corvina*, and the *umbrina*, which always ought to have been, and in fact, always have been, approximated to each other by naturalists; many of whom believe that they have found in them the sciæna or umbrina of the ancients. Artedi, who did not sufficiently distinguish the first two, united them with a third, in a genus, which he named sciæna. He has endeavoured to determine its characters, and if those which he has given do not entirely agree with all the species which analogy leads us at the present day to place in the family of the sciænoïdes, they represent pretty well the idea which he could form of it after the only two with which he was acquainted.

Linnæus has adopted this genus, but adding some species that did not belong to it, and modifying, in by no means a happy manner, its genuine character. His pupils, and especially Forskal, have increased the disorder by attaching themselves to one circumstance not very essential, to the faculty which the true sciænæ possess with many other acanthopterygians, of concealing the dorsal spines between the scales of the back. Bloch, considering but one circumstance of just as little importance, and relative to the scales of the operculum, has, again, combined the species otherwise than his predecessors, and this genus, natural in the origin, is altogether disfigured. Finally, to fill up the measure of fantasy, the same Bloch in his *Systema*, published by Schneider, has passed into the genus Johnius, the two only true sciænæ of Artedi, and has left under *sciæna*, only a confused mixture of heterogeneous species. M. de Lacépède himself, not having distinguished the sciæna from the persèques, further than by the absence of denticulations on the preoperculum, found himself obliged to place the umbrina in the second of these genera, while he kept corvina in the first, by which means he has totally broken the natural relations.

The Baron and M. Valenciennes, in their great work upon fish, in which the sole object has been to consult nature alone, consider that Artedi was the only ichthyologist who did not depart her paths. He merely committed the involuntary error of effacing one of the very remarkable species which our seas contain, namely, the maigre, which he has confounded with corvina. This fish is now restored to its existence, and its rank; and each of the three has become the type of a little series in the great tribe which embraces them. The abovementioned authors have associated with them other fishes, which approximate in essential points, but which some particulars constitute as chiefs of other series; and thus have they established truly natural characters of this interesting group.

The *sciæna aquila* is of large size, of a singular structure, very common on certain coasts, and celebrated for the goodness of its flesh.

The ichthyologists of the sixteenth century were all of them well acquainted with it. Salvian represents it under its Roman name of *umbrina*, which the Parisians, says he, call *maigre*, and his entire description accords exactly with the individuals seen by M. Cuvier himself.

Rondelet, who was better acquainted than any other person with the fishes of the Mediterranean, and whose work would be still so useful, if he had properly distinguished his own observations from those which he has drawn from the ancients, indicates and represents this fish, without any thing equivocal. After having described the *corvina* (*sciæna nigra*, Bl.) under the name of *coracin*, *corb*, or *corbeau*; the *umbrina* under that of *umbra*, or *doe*, and having even given it the name of *maigre*, he passes to another species named, he says, *peis-rei* (royal fish) in Languedoc, and which he considers as the *latus* of the ancients. "It is more white," he adds, "than the preceding two, either from its scales, or from its flesh. It wants the tubercle of the chin, which characterizes the doe (*sciæna cirrhosa*); it is less broad than the corb (*sciena nigra*, Bl.) Its scales are silvery and oblique. Its teeth are marked, and it has stones in the head." And as Rondelet applies to it afterwards what the ancients have said respecting the size of the *latus*, he thus tacitly attributes to it the same size.

We must remember here that the *latus* of the Nile is the variole (*perca nilotica*), but the latus of the Mediterranean of which these same authors speak, may very well be the maigre, which sufficiently resembles the *perca nilotica*, to cause the ancients to consider it as of the same genus.

Belon is neither less precise nor less exact. As well as Salvianus, he considers this fish of which we treat at present, as the *umbra* of the ancients. It usually weighs, he says, sixty pounds, and is sometimes four cubits in length. Its teeth are a little crowded, firm, sharp, in which it differs from the glaucus, which merely has asperities to the jaws. The *maigre* has no sting to the anal fin (this character is only true comparatively, the sting of this species being in fact single and very small); its caudal is neither forked nor round, but as it were angular; its scales appear oblique. In the ocean it has these scales most obscure; in the Mediterranean they present the brilliancy of gold and silver, and, when the fish moves, shine with all the colours of the rainbow. But at the same time that Belon so well describes the maigre, under its Languedoc name of *peis-rei*, he applies the Genoese name of *fegaro* to his *glaucus*, which, according to his description, must be the corvina, or *sciæna nigra*, L., although the figure which he gives of it is false, and joins to the oblique lines of the *sciæna cirrhosa*, a longer beard than that of any known sciæna.

Plumier was very well acquainted with this fish, and there is a good figure in his papers under the name of *aigle*, *negre* or *maigre* of the ocean.

The work of Willughby began to introduce confusion into a history in which none had hitherto existed, except these slight interspersions of vulgar nomenclature. This observer, or his editor Ray, speak of the sciæna only with hesitation, and without being able to fix the number or the characters; and they manifestly confound the species which had been distinguished by their predecessors. Among other errors they fancy that they have found the maigre in a young *corvina*.

It is easy, with a little attention, to perceive that the work of Willughby has served as a basis for that of Artedi, and subsequently for the part fish in the system of Linnæus. Artedi partakes of the hesitation of Willughby, on the distinction which should be made between the maigre and the corb, or *corvina*. He unites under one species the articles which regard these two fishes. Linnæus gives to this complex species the name of *sciæna umbra*, which should have belonged only to the maigre, but the characters which he assigns to it, such as black fins, &c., were those of the corvina, and from that time the maigre remained, as it were, effaced from the catalogues of naturalists.

It was to no purpose that Duhamel reproduced a new description and an exact figure. Neither Gmelin nor Bloch paid the least attention to it; and although the last had clearly announced that there existed an *umbra* different from the corb, and that Artedi and Linnæus were in error in confounding these two fishes, as he gave no figure of his *umbra*, and even speaks no further of it in his *Systema*, this species became totally forgotten.

What was more singular, was, that it should also have been effaced from the memory of the *gourmands.* Well known in Paris in the sixteenth century, under the name of *maigre*, as all the authors of that period relate, it is no longer known there under any name. It seldom happens that one or two individuals are seen in the course of the year in the shops of fishmongers, and they are so little in estimation that they have been sold at Dieppe, and those of the largest size, for ten and twelve francs. M. Cuvier however attests, from his own experience, that the flesh, though a little dry, is excellent eating, in whatever manner it may be prepared.

As they are generally obliged to sell the maigre in pieces, and as the head is the most esteemed part, the Roman fishermen were formerly in the custom of presenting this head, as well as that of the sturgeon, to the then magistrates, named *conservators of the city*, as a sort of tribute, so that they could only be eaten at their tables, or by their courtesy.

To this species belongs at the present day the Genoese name of *fegaro*, which has hitherto only been mentioned by Belon, but erroneously applied by him to a bearded species like the umbrina, if indeed this be not a variety.

At Nice they name this fish *figou.* M. Risso has described and represented it in his first edition, under the name of *persèque vanloo*, but without remarking its identity with those of which his predecessors had spoken, and giving to the first dorsal a configuration far from exact. Since that time M. Risso being at Paris recognized his fish in the two maigres, which Delalande had brought from Toulon, and in his second edition he names it *sciæna aquila.*

The brilliant colours which he attributes to it, prove the justness of the observations of Belon, on the brilliancy which the scales of the maigre assume in the Mediterranean.

It is said on good authority, that the maigre still bears at Rome the name of *umbrina*, as in the sixteenth century. M. Cuvier, however, is certain that it partakes it with the corb, which he has bought there under that name, though in the time of Salvianus, it was named *corvo de fortiera*. Perhaps this transposition of name existed already in the time of Willughby, and has occasioned his uncertainty respecting these two fishes. It appears that in the Mediterranean, it is more especially along the southern coasts that the maigre is propagated.

In proportion as we proceed northwards, the maigre becomes more rare. Pennant says nothing respecting it in his British Zoology. The fishermen of Fécamp, who sold to the Baron, in 1798, the first which he ever saw, were not at all acquainted with it. It was equally unknown in 1803 to the fishermen of Dieppe, who imposed upon it the name of *aigle*, but since then they have seen it from time to time. Two of them were caught there in the month of September, 1813, and one in 1822, which was presented to the *cabinet du Roi*, by M. Amédée Jaubert. In 1828, in the month of November, one of them was caught, which had engaged itself in the sluices of Dunkirk.

When these fishes swim in a troop they send forth a bellowing louder than that of the gurnards, and it has occurred that the fishermen, guided by their noise alone, have taken twenty maigres at a single throw of the net.

The fishermen assure us that the noise of the maigres is sufficiently great to be heard under twenty fathom of water, and they are careful from time to time to place their ear over the edges of the boat, that they may be directed by this noise, or this *song* as they are in the habit of calling it. But they vary much respecting its nature. Some say that it is a dull humming sound, others that it is rather a sharp hissing. In the environs of Rochelle, they have given it a peculiar term, *seiller,* as the verb *braire* is applied to the voice of the ass, and *aboyer* to that of the dog. Some fishermen pretend that the males alone make this noise in spawning time, and that it is possible to take them by imitating it, and without employing any bait. One of those which came from Dieppe was caught in nets spread near the shore. It was found sleeping, as often occurs to fishes taken in this way. But when it awoke, it agitated itself with so much violence that it caused the fisherman who approached it to tumble into the water, and the man was forced to call for assistance to enable him to master the fish.

Duhamel also tells us that the maigre is a fish of most extraordinary force, and that on this account it is customary to knock it down the moment it is taken.

This author relates that at Royan the fishermen consider the appearance of the maigre as an indication of the arrival of the sardines, and at Dieppe the same opinion is entertained touching the herrings. This fish, therefore, is like all the other large voracious species which follow the shoals of migrating fish, where they find excellent nutriment in abundance.

The stones which the maigre has in the ear, like all other osseous fish, but which in it, as well as in the corb and in the umbrina, are larger in proportion than in any other genus, have been remarked by the ancients, who frequently tell us that the umbra has stones in the head, and the people attributed to them imaginary virtues, such as they attribute to all singular objects. They were formerly named, according to Belon, *colic-stones*, and they were worn on the neck enclosed in gold, to cure and even to prevent this malady; but for this purpose it was necessary that they should be received as a gift, and those which were bought lost their virtue.

The detailed description of this fish is inadmissible within our limits. There is a species from the Cape *(sciæna hololepidota*, Cuv. et Val.) so similar that the Baron can scarcely affirm that it does differ specifically. According to MM. Quoy and Gaymard, this fish, from its abundance, constitutes a portion of the riches of Cape Town. Thousands of them are caught every day with the hook or drag-net. This fish is salted and dried like cod. Its flavour is excellent, and the flesh is firm.

The *sciæna pama*, or *bola pama*, of the Ganges, resembles the maigres in the rank of strong and pointed teeth which it has round each jaw, and in the extreme smallness of its anal spine; but it has distinct characters in the number of soft rays of its dorsal, which go from forty-one to forty-five, and in the singular form of its natatory bladder.

This is the fish, which, when but twelve or fifteen inches long, bears, more especially at Calcutta, the misapplied name of *whiting*, but it becomes considerably larger than our true whiting, and some of them are seen four or five feet in length. It is caught in great abundance at the mouths of the Ganges. But it never ascends higher than the tide. When it is very fresh it furnishes a light and salubrious nutriment.

We have now to speak of the subgenera *Otolithus* and *Ancylodon*.

The colonists of Pondicherry give the denomination, half French and half Portuguese, of *Pêche-Pierre*, to a fish of the former subgenus, in consequence of the large stones which it has, as they say, in the head, but which are the stones of its ears. Although this name indicates but a circumstance of organization common to the whole family of the sciænæ, it has served to form that of *otolithus* (ear-stone) which is given by M. Cuvier to this entirely foreign subgenus.

The *otolithi* resemble the maigres in all the details of their structure, and especially in the extreme smallness of their anal fins, and partake with them the general and exterior character of the sciænæ, the gibbous head, the cavernous bones of the cranium, the second dorsal long, &c.; but they are distinguished from the maigres and all the sciænæ, by two strong canines in the upper jaw.

The *otolithus ruber*, we are told by M. Leschenault, who saw it in its fresh state, is of a reddish colour over the body, and has a lateral silvery line. The natives of Coromandel name it *panan*. It arrives at fifteen inches in length. It is fished in abundance during the whole year in the Pondicherry roads, and its flesh is in estimation.

The *otolithi* of America differ from those of the East by the want of canines in the lower jaw, and have them only in the upper.

The one hitherto best known is the *weak-fish*, of the inhabitants of New York, described by Dr. Mitchill under the name of *labrus squeteague*. This is one of the most abundant fish at New York, and that which principally supplies the table, especially when the weather is not very cold. It usually attains fifteen inches in length, but some have been seen of seventeen, and weighing more than six pounds. It so constantly accompanies the striped basse, that Dr. Mitchill had been tempted to give it the specific name of *comes*. It is caught every where, where they catch the basse, but in salt-water only. It does not ascend into the rivers nor into the ponds of fresh-water. It is fished for with the line, and some persons think that its name of *weak-fish* is derived from its not drawing much upon the hook; others that its continual use as food is enfeebling to men obliged to labour. The fishermen attribute to it certain dull sounds similar to that of a drum, which are heard sometimes under the water, and only in the season when it is abundant. This gives it an additional relation with the maigres. With its natatory bladder an excellent isinglass may be made, as with that of the sturgeon.

The name of *squeteague* is that given it by the Narraganset

Indians. The Mohigans call it *checous.* The French of New Orleans also have it, and have given it the name of *trout,* in consequence of its spots.

This fish does not seem to be peculiar to North America. It has also been received by the Baron from Martinique.

The *Lonchurus ancylodon* of Bloch is substantially nothing but an otolithus with a pointed tail, and distinguished from the others only by the extreme length of some of its teeth, and the shortness of its muzzle; but the cavities of its cranium, the nudity of its palate, the length of the second dorsal, too clearly indicate its natural family to admit of deception. And these external indications are confirmed by those furnished by the viscera, the bladder of the ancylodon having two horns, and its pylorus four appendages, as in otolithus. Bloch has associated this fish under the generic name of *lonchurus,* (lance-formed tail), and only in consequence of the pointed form of its caudal, to another fish of the family of the sciænæ (*lonchurus barbatus*), which has the teeth equal, and has two barbels; distinctive characters very superior in importance to the common character of a pointed tail, which is found elsewhere more or less in a tolerably great number of otolithi, of corvinæ, and of Johnii. The Baron has made a particular genus of the ancylodon.

The corvinæ differ from the maigres and otolithi in the thickness and length of their anal spine, and form the otolithi in particular, having no canines. The absence of barbels distinguishes them from umbrina and pogonia. Besides the disposition of the teeth is peculiar. Smooth and even in the two jaws, they are preceded in the upper jaw by a rank stronger than the others, and formed of pointed but equal teeth.

The *corvina nigra* is caught in salt lakes and ponds as well as in the sea; but it does not appear that it ascends rivers.

Belon, who has described it under the name of *glaucus*, although he has placed under the same name a figure which belongs to the umbrina, assures us that there are found in its stomach small crabs, prawns, scolopendra and fucus. It comes in spring to deposit its eggs and its milt in the calcareous pebbles of the shore. Its flesh is less esteemed than that of the umbrina barbata, and of the maigre, yet, nevertheless, it is often sold for the latter in the markets. There are a great number of foreign species analogous to this corvina.

The JOHNIUS of Bloch, is allied to corvina by a scarcely interrupted series, and differs only in having the second anal spine more weak and shorter than the soft rays which follow it, a character in which they approximate a little to the maigres. Accordingly Buchanan unites the species of those three groups, which he took in the Ganges, in his genus *bola.*

The Johnius forms a considerable portion of the aliment which the sea and the rivers furnish to the inhabitants of India, and as the flesh is whitish, light, and of but little flavour, the English at Bengal call these fish *whiting.* The species are tolerably numerous. *Bola* is the generic name in Bengal. Along the coasts of Orixa and Coromandel, they are designated by that of *katalai*, *katelé*, or *katchelé*, to which some peculiar epithet is united for each species, and which is also applied to corvinæ and umbrinæ.

As we have already seen, the names of *umbra* and *umbrina* are variously applied to the three principal sciænoïdes, which has occasioned more than one mistake, and has caused to be attributed to one of these fish what belonged to the other. Cuvier restrains the term umbrina to the *sciæna barbata* and its foreign analogues, that is, to fishes which to the characters common to these sciænoïdes with double dorsals, join a small barble attached under the symphysis of the lower jaw.

The POGONIÆ are in some sort umbrinæ, which, instead of a single barbel under the symphysis of the lower jaw, have numerous ones under its branches. This genus has been established and named pogonias by Count Lacépède.

These fish are remarkable for their great size and for the noise which they send forth, and which has gained them the vulgar name of *drum*. Linnæus received one from Garden, and conferred on it the ancient name of *chromis*, precisely on account of this noise; but he placed it among his *labrus*, from what analogy it is difficult to divine, and makes no mention of its barbles, probably because he received it only in a dried state. Finally, he regarded it as identical with the *guatucupa* of Marcgrave, which is an otolithus, and with the drummer or fourth *chromis* of Brown, which is an *umbrina*.

Various accounts are given concerning the nature of the noise of these drums. According to Dr. Mitchill, it is when they are taken out of the water that they send forth this noise; but Schœpf, who speaks of the drum under the name of *labrus chromis*, says that it is under the water that this noise is dull and hollow; that several individuals assemble round the keel of ships at anchor, and that then their noise is most sensible and continuous. This account may seem extraordinary, and yet it is perfectly conformable with what has been latterly reported by an American traveller.

This is Mr. John White, Lieutenant of the Navy of the United States, in his Voyage to the Seas of China, published in 1824. He relates, that being at the mouth of the river of Cambodia, his crew and himself were astonished by some extraordinary sounds which were heard around the bottom of their vessel. It was, says he, like a mixture of the base of the organ, the sound of bells, the guttural cries of a large frog, and the tones which imagination might attribute to an enormous harp; one might have said that the vessel trembled with it. These noises increased, and finally formed an universal chorus over the entire length of the vessel and the two sides. In proportion as they went up the river the sounds diminished, and finally ceased altogether. The interpreter told Captain White that they were produced by a troop of fishes of an oval and flatted form, which have the faculty of strongly adhering to divers bodies by the mouth.

M. Humboldt was witness to a similar fact in the South Sea, but without suspecting the cause. On the 20th of February, 1803, towards seven in the evening, the whole crew were astounded by an extraordinary noise, which resembled that of drums which were beating in the air. It was at first attributed to the breakers. Speedily it was heard in the vessel, and especially towards the poop. It was like a boiling, the noise of the air which escapes from fluid in a state of ebullition. They began then to fear that there might be some leak in the vessel. It was heard unceasingly in all parts of the vessel, and finally, about nine o'clock, it ceased altogether. From the narrations from which we have now extracted, and from what so many observers have reported touching various sciænoïdes, we may believe that it was also a troop of some of their species which occasioned the noise in question.

It would be an object of curious research to find out the organs in these fishes which seem to produce such strong and such continuous sounds, and that at the bottom of the water, and without any communication with the external air. Most of the sciænoïdes have large natatory bladders, very thick, provided with very strong muscles, and which in many species have prominences or productions more or less complicated, which penetrate even into the intervals of the ribs. This may direct the attention of physiologists to this point, but at the same time it must be observed, that these bladders have no communication either with the intestinal canal, or with the exterior generally.

The drums, according to Dr. Mitchill, swim in numerous troops, in the shallow bays in the south coast of Long Island, where the fishermen find them during the summer. They are lazy and stupid fish. Schœpf says that they are found in still greater abundance, and during the whole year, along the coasts of Carolina and Florida.

There are also some of these fish along the coasts of Brazil; and specimens have been seen by the Baron, which could in no wise be distinguished from those of the United States. A pharyngeal bone of one of them, represented by Jussieu, came from Brazil, and differs not in the least from specimens brought from New York. Thus we cannot doubt that the same species lives in these two latitudes.

There are pogonias also to be found further to the south, for the *courbina* of the inhabitants of Monte Video is certainly one. This fish was caught by Commerson in the waters of that town, while he was there with Bougainville in 1767. Having then but little practical knowledge of fish, and able to study them only after the method of Linnæus, it was to the genus silurus, such as it had been formed by the Swedish naturalist, that he conceived he ought to refer it. But he took care to remark that it rather resembled sparus. He made of this fish a genus which he called *pogonate*, left to the species its name of *courbina*, and subsequently associated with it an umbrina, which he called *pogonate doré*. Nevertheless his description leaves nothing equivocal: it is much detailed, and conformable with that of the large drums in all points, even to the numbers of the radii and the stones of the ears.

The genus HÆMULON, *Rouge-gueule*, or red-throat, is so named from the red of that part of the lower jaw which is covered when the mouth is closed.

At the head of the sciænoïdes with less than seven branchial rays is placed a small group of LOBOTES, which has but six, and which is distinguished by a short muzzle, a prominent lower jaw, a chaffron somewhat concave and very strong, denticulations to the preoperculum, and especially because the soft parts of the dorsal and the anal are elongated into obtuse points, which, with the rounded caudal, cause the posterior parts of the body to appear to be divided into three lobes.

The *Lobotes Surinamensis,* we are told by Bloch, attains the size of our common perch, that its flesh is sweet and fat, and that it is considered as one of the best fish of Surinam. Dr. Mitchill has described and represented a fish perfectly similar to this in form and details, and which probably is the same; he names it *Bodianus triourus,* or *triple-tailed black perch.*

It is brought but seldom to New York. Dr. Mitchill has seen one thirteen inches long, and weighing twenty-seven ounces, taken on the coast of New Jersey, near Powles-Hook. But there are some larger, and which weigh four or five pounds. Some fishermen of the country also call it *black grunts (labrus niger).*

SCOLOPSIDES was a genus almost new to naturalists when first proposed by M. Cuvier, in 1817. The brief but comprehensive characters given by the Baron in the text supersede the necessity, with reference to most of the genera, of our enlarging on mere structure.

Many acanthopterygians have at the lower part of their pectoral some simple and not branched rays although articulated. Numerous examples of this are to be found in the family of percoïdes, and in that of the buccæ loricatæ. In some, as trigla, these rays are not united to the others by a common membrane, and move freely; in others, such as scorpænæ, they are not only united by the same membrane, but they do not pass it. There are some, in fine, as the cirrhites, in which these radii, although united by the common membrane, are thicker than the soft rays, and prolong their extremity beyond the edges of the membrane. These different characters are also to be met with in the family of the sciænæ.

With a new genus from Australia (MACQUARIA), of the habits of which nothing is known, the Baron concludes that the genus *sciæna*, according to Linnæus' conception of it, should terminate. The subsequent genera form a more separate group, which might, under many points of view, be even considered as another family. Their head has no cavernous inflations; their natatory bladder never presents appendages; their body is generally short, and of an oval form, but, like the true sciænoïdes, they have some armature to the opercular pieces, and some appendages to the pylorus, and they are destitute of teeth to the palate. This determined the Baron to approximate them as an appendix to this family.

The near relationship of these fish cannot be mistaken: some attention is necessary to detect their differences, while their resemblance strikes one at the first glance. Nevertheless, authors have dispersed them into genera widely different. Their *amphiprion* has been associated to *holocentrum*; *premnas* to *chætodon*, to *serranus*, to *scorpæna*; *pomacentrus* and *glyphisodon* to *chætodon*, although possessing nothing of the character.

It might be rather among the labroïdes that one might find some analogies to these divers genera, for many labroïdes have also the lateral line interrupted, and all have the palate without teeth; nevertheless many external differences, slight it is true, and especially this important circumstance, that none of the labroïdes have cœcal appendages to the pylorus, nor even a stomach like a cul-de-sac, do not permit us to adopt this approximation.

All these fish are small, and, with few exceptions, live in the Indian Ocean, the shores of which they embellish by the splendid colours reflected by most of their species. They are seen incessantly swimming with great vivacity between the rocks, and in the small pools of water which are left by the sea at the time of the reflux. Although generally edible, none of their species furnish an important article of nutriment, in consequence of their diminutive size, and because they are not gregarious.

We proceed to the fourth family, the SPAROIDES.

Artedi had united in his genus *sparus* fifteen species of fish, most of them of the Mediterranean, and all resembling each other in an oval body, a spiny dorsal, undivided and not scaly, a palate without teeth, a preoperculum not denticulated, an operculum not spinous, the membrane of the gills supported by five or six rays and some few pyloric appendages. All these positive characters would have determined the Baron and his co-adjutor to leave these fishes and the numbers analogous, which have since been discovered for them, together, had it not been that among the groups which should compose this family there were some whose parts could not exactly be thus defined, notwithstanding the relations by which they are connected with the rest. Such, therefore, our eminent ichthyologist was forced to separate from this family. We shall first speak of the genus SARGUS.

The most prominent character of this genus consists in the form of the incisors, which are broad, compressed, and truncated at their extremity, rendering them similar to human incisors, especially in the individuals of large dimensions.

The sargi are littoral fishes, common enough on the coasts of the southern provinces of France, and one species of which at least is to be seen on the western coasts of Spain; but they do not advance beyond that along the northern coasts of the ocean. They do not enter the channel, and we find no mention of them in the north of Europe. Pennant, Donovan, Muller, Linnæus, and also Fabricius, are alike silent regarding them.

These fishes in general feed upon the small testacea and crustacea, whose hard and coriaceous envelope they can easily break with their molars. But several species have also a herbivorous regimen. In some, belonging to the Red Sea and the Atlantic Ocean, the Baron has found the stomach and the entire intestine filled with fucus very easy to be recognized.

The unanimous agreement of the people which surround the Mediterranean to designate these fishes by names derived from *sargus*, such as *sargue, sargo, sar, saragu*, &c. indicated long since that they must be the σαργὸς of the Greeks, and the *sargus* of the Latins; and what the ancients have told us concerning their sargus does not contradict this indication.

It was a spinous fish, with firm flesh, which had a black spot to the tail, and whose body was marked with several black lines—characters which perfectly well agree with the first species (*Sargus Rondeletii*, Cuv. and Val.)

We may not, however, vouch with equal certainty for the truth of all the details which the ancients have left us concerning the habits of this fish.

According to Ælian and Oppian the male sargus pretended to the possession of many females, and fought with fury to drive away the other males. Even this passion was employed as a means of catching it. A bow-net, or weel, constructed of branches and verdure presented it an asylum, into which it compelled its females to enter, and lastly came in itself, and was taken along with them.

The same writers attribute to it a still more extraordinary disposition, namely, a lively friendship for goats. If one of these appeared upon the shore the sargi would swim towards it with rapidity, exhibiting their joy by great leaps. This propensity was blind enough to enable a fisherman, covered with the skin of a goat, with its horns, and who scattered in the water flour steeped in goat broth, to attract and catch as many of these fish as he pleased. He could even take them with the hand, being only careful to rub down their spines along the body. They also, however, used to employ more simple means; a salted anchovy put upon a hook would attract them in great numbers.

The rest of the history of the sargus was equally natural. A littoral fish, it especially sojourned in the submarine grottos, where the sun penetrated through small apertures. Its address in fraying and breaking the line by which it was taken was wonderful. It followed the mullet very closely, and when this last had shaken up the mud the sargus used to swallow the alimentary particles which were thus raised. It laid eggs twice a year, at the period of the equinoxes.

If all these facts be true, they prove to what a degree the knowledge of the ancients respecting the manners of fish exceeded ours, for the moderns have done nothing but copy them in the instance of the sargus. Neither Belon nor Rondelet say anything from themselves; still less Gesner and Aldrovandus: Willughby confines himself to external description; and we almost descend as far as Duhamel before we meet any original observations concerning these fish.

That naturalist has published, under the name of *Sar de Toulon*, a description and figure easy to be recognized as the *Sargus Rondeletii*, only that the caudal spot has been forgotten. According to the information which he received from Toulon, the sar feeds upon small fishes, small testacea, and crustacea; but its jaws not being strong it cannot break shells which are somewhat thick, so as to get at the inhabitants. The sar precipitates itself with avidity on hooks which are baited with little fish, and the fishermen attract it with a paste, composed of cheese, damaged pilchards, and flour; this will not attract fish of the next genus, the *Daurades*. It is altogether a littoral fish, never remaining from the shore as the daurades do, which never approach it in winter, except when pursued by some large fish.

The American seas support many sargi, among which there is one belonging to the United States bearing a very close resemblance to the first species of this genus; it is called the *sheep's-head (Spargus,* or *Sparus ovis.)*

Schœpf observed this fish, and designates it under the name which it still bears at the present day. He gives a recognizable description of it in his Memoir on the Fish of North America. According to him the *sheep's-head* is in great estimation. It approaches the coasts during summer, and its principal aliment consists of small shell-fish.

It is astonishing enough that a species so common should have been unknown to Linnæus; and that Gmelin, in his compilation, should have paid no attention to the description of Schœpf. We find no subsequent description of it but in the Memoir of Dr. Mitchill on the fishes of New York. He there speaks in highly eulogistic terms of the flesh of this fish, and of the high esteem in which it is held by the inhabitants of New York. "The *sheep's-head,*" he tells us, "may be served up upon the most sumptuous tables, because, perhaps, it does not yield in flavour to any fish, the trout and salmon excepted. The price varies from a dollar to a dollar and a half for an individual of the middle size, and beyond this size the price rises from four to seven pounds sterling. Some have been seen weighing from fourteen to fifteen pounds." "Nothing," says Dr. Mitchill, "can surpass, in the opinion of a native of New York, a sheep's-head boiled."

This sargus is one important object of fishery on the coasts of the State of New York. It approaches those of Long Island in the hot season from the month of June to the middle of September, a period about which it again buries itself in the depths of the ocean. Some of them remain rather late, and Mitchill has seen them brought, in the year 1814, to the market of New York towards the end of October. They swim in troops; accordingly they are advantageously fished for with the net, and many hundred may be taken at a single cast. With the large nets which they use at Rayner-town, Babylon, and the two islands, thousands of these fish are drawn to land. They are packed in ice, and carried with the greatest haste to the markets of New York during the cool of the night; and when the season is tolerably cold they are carried to Philadelphia, to Jersey, and other places. In consequence of its trenchant teeth it is difficult to take the sheep's-head with a line, because it cuts the hooks: great pains are also employed to draw it into the creeks and coves, and there it is more easily taken.

The species of CHRYSOPHRIS are numerous, and extended through all seas. The Mediterranean produces two, which have not yet been distinguished one from the other by naturalists. Perhaps the *hepatus* of Rondelet may prove to be a third, when ichthyologists shall have had an opportunity to recover this fish, which as yet has been indicated only by that author.

The anatomy of the daurades, or chrysophris, differs but little from that of the sargi. The stomach is simple, and we reckon but from four to five cœca to the pylorus. No fucus or marine plants have been discovered in the intestines of such as have been dissected. They have not, like the sargi, the facility of cutting these plants with their incisors, to cause them to pass under their molars; but their teeth, which are stronger, enable them to break the thickest shells, and there are found in their stomach debris of turbo, of trochus, of monodon, of natices, and other testacea with extremely hard shell.

The French name of this fish is written and pronounced *daurade*, to distinguish them from fishes of a totally different genus and family (the scomberoïdes), which are generally called *dorades* by navigators, and are the *coryphæna* of Linnæus.

The name of *daurade* comes from *aurata*, which appears to have been the denomination of these fish among the Latins. The ancient Greeks named them χρυσοφρυς, (golden eyebrow), in consequence of the spot of fine golden brilliancy which the common species has between the eyes. Thus at least, it is believed, we can explain the name and prove its application, for as to the rest we find nothing in the ancients which is absolutely characteristic, though at the same time we find nothing which can give rise to exclusion.

According to Aristotle, the chrysophris has two pairs of fins, its pyloric appendages are few in number; it remains close to the coasts, and in salt marshes or pools; it spawns in summer, and deposits its eggs at the mouths of rivers; the great heats oblige it to conceal itself, the cold also causes it to suffer; it is carnivorous, and the fishermen take it by striking it with a trident when asleep.

Ælian tells us that it is the most timid of all fishes: some branches of poplars implanted in the sand, during a reflux, so terrified the chrysophris which were brought back by the flood, that on the succeeding reflux they did not dare to move, and suffered themselves to be taken by the hand.

That the *aurata* of the Latins was the same fish as the chrysophris of the Greeks is evident, from a passage in Pliny, which is manifestly taken from Aristotle, and where the first word is put as a translation of the second.

Columella tells us that the *aurata* was of the number of those fishes that the Romans brought up in their *vivaria;* and even the inventor of vivaria, *Sergius Orata,* appears to have derived from the daurade the sirname which he bore, and which he left to his branch of the family. It was, above all, the aurata of the Lucrine Lake that the Romans esteemed, and Sergius, who obtained nearly entire possession of that lake, in all probability introduced the species there.

The first species is the *chrysophris aurata*, which is the most abundant in Europe. It is found on almost all the coasts of the Mediterranean, and on some of those of the Atlantic; the largest come from the Lake of Bisertum, near Tunis. These individuals are more than fifteen inches long. This fish does not quit the shore, and it enters into the salt pools, where it grows extremely fat. At Montpellier, in the time of Rondelet, they held in high estimation the chrysophris of the Pond of Martigue.

It is to Duhamel that we are indebted for the best information respecting the habits of this fish. The fishermen told him that the chrysophris agitate the sand forcibly with their tail, so as to discover the shell-fish which have buried themselves there. They are extremely fond of mussels, and the fishermen recognize the presence of the chrysophris by the noise which they make in breaking the shells with their teeth.

This fish dreads cold very much; and Duhamel remarks, that the severe winter of 1766 caused a great number of them to perish.

We find this chrysophris noticed by all authors who have described the fishes of the Mediterranean; it is also noticed by those who have treated of the fishes of the Atlantic. Duhamel speaks of it many times; Pennant names it among the fish on our English coasts, and calls it *gilt-head*. But Donovan and Turton have not the true chrysophris; their *gilt-head* is the *Sparus centrodontus*, which is common enough on the coasts of the channel in the months of August and September. It does not appear that the chrysophris advances farther to the north, for Otho Fabricius, Muller, and the other authors of Northern Fauna, make no mention of it.

From the chrysophris are separated such sparoïdes as present, like them, in front of the jaws four or six strong and conical teeth, and have on the sides but two ranges of round teeth. Many foreign species, however, have behind the canines numerous little granular teeth; but the species of the Mediterranean, to which the name of Pagrus is attached, have these teeth still finer. The first thus connect this genus to the chrysophrys, and the last conducts to the pagellus; but that which, besides the strong anterior teeth, distinguishes the pagri from the pagelli, is having the body more squat, and the same number of rays as chrysophrys: the ranks of their molars being reduced to two, their jaws are not enlarged and their muzzle is less thick than that of the chrysophrys, with which they have otherwise very great resemblance.

The common pagrus (*P. vulgaris*) appears to be chiefly confined to the Mediterranean. Like so many other fish, it has given rise to various errors in nomenclature and representation. The different denominations which it has received on the coasts of Italy, Sicily, and Greece, all seem referrible to the *pager* or *pagur* of the ancient Romans, and the words of Ovid, *rutilus pagur*, do not seem to belie this etymology. Aristotle speaks of the φαγρος as a pelagic fish, and one that has stones in the head. All the ancients attributed to it a firm flesh and the habit of feeding upon shell-fish. Thus there appears no reason to suppose that their pagrus is not the same as the modern. But it must not be confounded, as it has been by many, with the φαγρωριος, which was a fish of the Nile, sacred with the inhabitants of Syene, and which gave its name to the town φαγρωριοπολις.

We have no proof that the pagrus exists in the channel or in the more northern seas. Pennant, it is true, mentions it in the second edition of his British Zoology, but it is the *centrodontus* which he appears to have had in view.

Under the name of Pagellus certain sparoïdes are assembled, with rounded molars, whose anterior teeth are all more or less fine, like carders, and not strong and conical like those of pagrus and chrysophrys. Their molars are smaller than those of pagrus, and consequently much more so than those of chrysophris. There are frequently more than two ranges, but those of the two external ranks are the thickest.

The pagelli live on fish and shell-fish, go in small troops, approach the coasts towards spring, and remain there until winter. There are even some species which sojourn the whole year on the coasts of the sea of Nice.

The common pagellus (*P. erythrinus*, Cuv.) is very abundant in the Mediterranean, and even enters the Atlantic, where it advances pretty far towards the north. They are numerous at Marseilles, Naples, Nice, Genoa, and Sicily. Gronovius took one at Schevelingen, though the pagel must be rare in so high a latitude, for it is not to be found in Donovan or Pennant. We certainly find in the Danish Fauna of Muller a *sparus erythrinus*, but its characteristic phrase and its citation from Olafsen are referrible to the sebastes of the north. The article which he cites from Strœn appears to indicate the *sparus salpa*. Other authors of Northern Fauna make no mention of it.

The pagel does not approach the shore except towards spring. It is commonly found at the depth of fifty or sixty fathoms, and Duhamel says that the female suffers her eggs to escape at this great depth. According to M. Risso, this fish is found during the whole year on the rocks of the coast of Nice.

The genus DENTEX is so called after the ancient name of one of the species. It consists of fishes of the family of the spari, which have only conical teeth in both jaws, usually on a single rank, with some of the anterior elongated into large hooks. Like the other spari, they partake a good deal of the character of the sciænoïdes with simple dorsal, but are easily distinguished by their preoperculum not being denticulated, but having the edge entire. As their operculum is terminated by a flat and obtuse point, and by a festoon, which in the fresh state disappear within the membrane, but which are seen a little in the dried individuals, there are some of them which certain naturalists have referred to the genus *bodianus*, such as it was established by Bloch, a genus which M. Cuvier has united to serranus. But the dentex differ from these bodiani, that is, from the serrani with preoperculum without any sensible denticulation, by the absence of all kinds of teeth in the vomerian and palatine regions, and because they have but six rays to the membrane of the gills.

There are two species in the Mediterranean, which form the types of two small tribes. One named *denté* in Provence, and *dentale* in Italy, is the *sparus dentex* of Linnæus; the other less extended or less observed, is called *bouco-rougo*, at Nice, and is the *sparus macrophthalmus* of Bloch. The first has the eye smaller, and the suborbital broader, which gives an elongation to the muzzle: the second has the suborbital more narrow, and the eye of a remarkable size; all the body is red, with gilt lines on the sides.

Both these species appear to have been known to the ancients, and there is reason to believe that the first is the dentex of the Romans.

The *dentex vulgaris*, according to Risso, attains three feet in length, but this is doubted by others, who describe them as much less. Paulus Jovius, and others, speak highly of those of Dalmatia, and state that the inhabitants of this coast cut them in pieces, and pack them in barrels with saffron.

The Mediterranean contains a second dentex, easily to be recognized by the largeness of its eyes (*D. macrophthalmus*), which is also red. It is much less extended than the common species in the western part of that sea. Belon mentions it as scarcely known there (*nostro littori admodum rarus aut eo nomine ignotus*). Risso has observed and described it sufficiently; but Belon, though partially acquainted with it before, has partly confounded it with the common species, for that which he relates after Paulus Jovius concerning the mode in which the Illyrians preserve it, can be applicable only to dentex vulgaris.

Risso says it always continues smaller than the true dentex, and attains a length not exceeding eighteen inches, and a weight of not more than two pounds; but Belon tells us that there are some of six pounds weight, and that he has never seen any very small. These statements might induce us to believe that this species propagates chiefly on the Barbary, and not on the European coast.

The Indian seas contain some fishes nearly allied to dentex, which form a small group (PENTAPUS) in which the extremity of the jaws has only two strong teeth, between which sometimes two or four smaller ones are to be seen: the other teeth are small and crowded, and placed on a very narrow band.

The name is derived from their long and pointed scales, placed one between the ventrals, and the other two at the base of these fins, which gives them the appearance of having five ventrals, or five feet. This character, however, is not altogether peculiar to them, for it is found in other fishes, and particularly in most of the menides.

The mouth is but little cleft; the body is rounded, and covered with scales of no great hardness, which advance upon the forehead more than in the genus dentex.

Linnæus was not acquainted with the pentapodes. Their discovery is due to Commerson, who first described one of their most brilliant species (*vittatus*), which he saw in the Isle of France in 1769.

The subgenus LETHRINUS is distinguished by a character easily observed, the nakedness of a considerable portion of the head. They partake much of the nature of dentex, but besides the nakedness of the head, are distinguished from them by the form of their side teeth. Like dentex they have four or six pointed incisors, often crooked, and behind them a narrow band of small and crowded teeth; but on the sides of the mouth towards the back, the teeth are in general tuberculous and rounded, and as they are always on a single range, the fishes of this genus cannot be confounded with other sparoïdes with round molars and a scaly preoperculum.

All the species of this genus feed on shell-fish, which they can easily break with their rounded teeth. Only one species is found in the Atlantic; all the rest come from the Indian Seas.

The CANTHARI compose a tribe of the sparoïdes, characterized by their teeth, which are described in the text. Their mouth is but little cleft, and is by no means protractile, by which they are distinguished from the menides.

There are four species in the European seas, one of which is indicated in the *Systema Naturæ*. Their food is in general animal, though the remains of fucus have been found in their stomach. They are very voracious, and are easily caught with a line. Risso, in describing the colours of the common cantharus, adds, that at spawning time this fish becomes less brilliant, and that the female is always paler than the other sex.

The cantharus is very common in the Mediterranean, and is found in almost all parts of that sea; but it does not appear to frequent the coasts of the Atlantic, nor is mention of it made by any of the writers who have described the fishes of that sea, and no northern ichthyologist takes notice of it.

According to Risso, the cantharus lives isolatedly; its flesh is soft, and in no great estimation as food. In the latter point he agrees with Rondelet; but as to the former, Rondelet states that the canthari go in shoals, and that they seek places where the water is in motion, and that when taken in such localities, their flesh has a better flavour if they have continued there any time.

A fourth tribe of the family of the sparoides is composed of species which have on the front of the jaws a range of flatted teeth, crowded one against another, including originally in the text of the Regne Animal only two genera, to which the Baron, in his great work on this class, has added two others, making four in all. These are BOOPS, which have no other teeth behind those on the edge of the jaws, and which are notched; SCATHARUS, with the teeth also in a single rank, but flatted, pointed, and not notched; OBLADA, which have behind their notched incisors a band of small and crowded teeth; and CRENIDEUS, with denticulated incisors, and a group of small tuberculous teeth behind them.

The smallness of their mouth, and the weakness and shortness of the spinal rays of their vertical fins, distinguish these genera, moreover, from those in other respects near them.

The common Boops is a species very abundant in the Mediterranean, which has, in common with the salpa, another species equally common in the same sea, a character in the teeth already alluded to, from which both may properly be united in a small genus. These live on marine plants, and accordingly their intestinal canal is very long, though they have few appendages round the pylorus. The two species, both of the European seas, are well known, and have been long celebrated for the beauty of their colour, and quality of their flesh as food.

The boops spawns twice a year, and then comes toward the shore in shoals, at which time especially it is much prized for the table. Its fecundity is very useful to the inhabitants of the coast of Provence and of Nice, where the simple fishermen employed in taking them fancy they promote their object, by suspending to their boat little silver figures of this fish. It appears, however, that in Spain it is eaten only by the poorer sort of people, though so generally esteemed elsewhere.

The OBLADA is also a Mediterranean fish: Belon asserts that it is met with in the north part of the Atlantic, but very rarely. It swims at moderate depths along the coasts during the whole year, though the female may be seen occasionally pursued by the male, swimming with great swiftness along the surface of the sea.

MÆNA, the first genus of the fifth family of the MENIDES, lives near the coasts in places abounding in algæ, and with a muddy bottom. Their food consists of small fish and naked mollusca, which they find among the marine plants.

The common mæna inhabits various parts of the Mediterranean, and is taken at all times of the year. The females spawn in July and August. It is absolutely rejected as food: its very name, indeed, in Venice, seems to designate a person or thing of no worth, and to call a person *magnamenole* is a very great insult.

The species of the genus SMARIS all inhabit the Mediterranean, though some advance into the Atlantic, and are found at the Canary Islands, and on the western coast of Africa, and even so far as the Antilles.

The common smaris, according to Belon, is the *marida* of the modern Greeks. It lives near the shore, and feeds on small crustacea. These fish abound so much at Iviça, that, according to Laroche, they alone form more than one half of the total product of the fishery of that island. Rondelet tells us that after being salted they are exposed to the air to make a sort of garum. It would even appear that the French name of this fish, *picarel*, is derived from its pungent taste when so prepared. But Duhamel appears to have corrected this mistake, for according to the observations of a correspondent of his from Antibes, the picarel, or *pitre*, is confounded with a fish of the herring kind, known there under the name of *pyraie*.

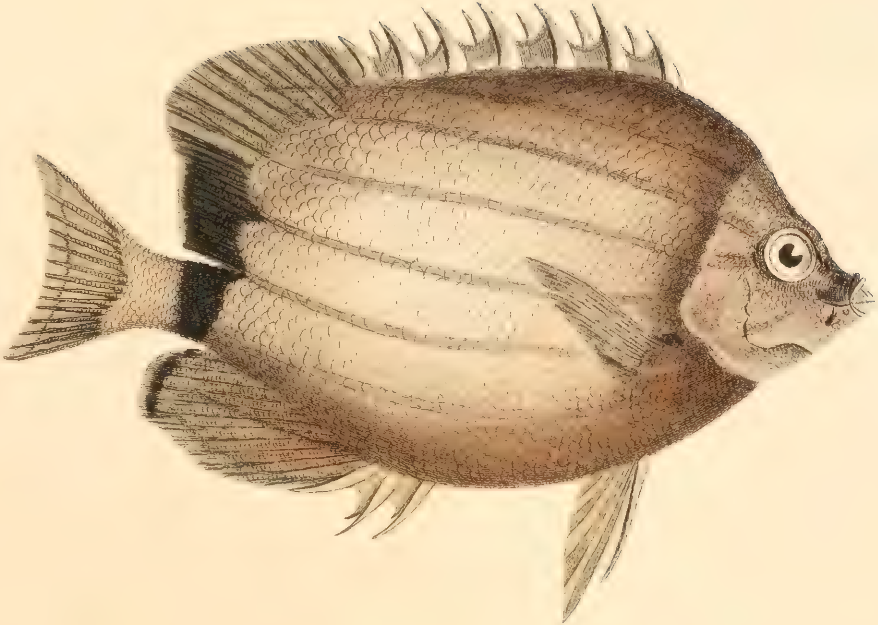
The genus GERRES is found in both oceans; specimens have been received in Europe from both North and South America, from most parts of the Indian Seas, and from the Pacific Ocean. The *Gerres Plumieri* is the most common fish at Porto Rico. Its flesh is remarkable for the rapidity with which it is decomposed; it becomes quite soft a very short time after the fish is caught.

The *Gerres rhombeus* appears to be indifferently represented in Sloane, under the name of *Pagrus totus argenteus*, and stone-bass. It might be referred to the latter, or to a species called *Brasilianus*. Sloane tells us that it is one of the best fishes of Jamaica, and that it is taken as well in the sea round that island, as in the rivers and fresh waters of its interior.

Mr. Couch relates, in the Linnæan Transactions, that specimens of this species are sometimes seen to arrive in numbers on the coast of Cornwall, following pieces of wood covered with anatifæ, from which it would seem that they feed on these animals, but Cuvier never found any thing in their stomach but the remains of small fish.

In the sixth family, SQUAMMIPENNIS, especially in the genus CHÆTODON, the seas of the torrid zone possess animals not less ornamented by the hand of nature than the countries whose shores are bathed by these waters. If the hot countries of Africa and America have among their feathered tribes their souimangas, their humming birds, their cotingas, and their tanagers, the intermediate seas support myriads of the finny race still more brilliant, whose scales reflect the tints of metals and precious stones, heightened in effect by spots and bands of a more sombre hue, distributed with a symmetry and variety equally admirable.

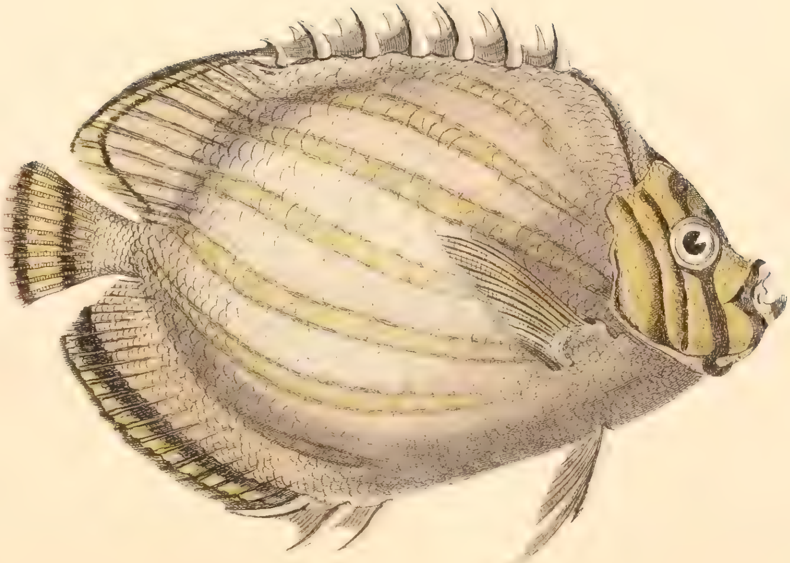
The genus chætodon has many species in which nature appears almost to have disported herself by clothing them in the most gaudy manner. Rose, purple, azure, and velvety black, are distributed along the surface of their bodies, in



Chætodon Tremblyi Ben

London Published by Whittaker & C° Ave Maria Lane 1834

Fish Pl. 20



Chætodon ornatus. G.Gray.

[illegible]

stripes, rings, and ocellated spots on a silver ground; nor are the beauties of these fish lost to man, or confined to the depths of ocean. They are small, and usually remain near the shore between the rocks, where there is but little water. Here they are incessantly sporting in the sunbeams, as if for the purpose of displaying the ornaments they have received from nature.

The name chætodon expresses the hair-like character of the teeth. They were not unknown to the ancients. Their flesh is in general of a good flavour, but we know little of their habits beyond the fact of their frequenting the shallow waters of the shores as already stated.

We insert a figure of the *Chætodon Fremblii*, described by Mr. Bennet in the fourth volume of the Zoological Journal, p. 42, and the *Chætodon ornatus* of Gray, in the British Museum.

But two species of CHELMONS are known, both of the Indian Seas. *Chætodon rostratus*, Lin., inhabits the coast and rivers of Java, and we are told that when it sees an insect on a blade of grass on the shore hanging over the water, it shoots forth a drop of water with great precision at the insect from a considerable distance, thereby causing it to fall within its reach. Schlosser has described this curious process in the Philosophical Transactions for 1764, after Hummel, and Reinwardt has since observed and confirmed it. It is even an amusement with the Chinese of Java to keep these fish in vessels, above which they place an insect on a thread or stick. This curious process is, indeed, not confined to the chelmon, as the toxotes appear to possess a similar instinct. We are not informed whether the other species of this genus, *C. longirostris*, has the same habit as its congener, but from its similarity of organization it should seem probable.

The common HENIOCHUS (*macrolepidotus*) is a large fish, celebrated in India for its culinary qualities. The Dutch colonists call it *vlag-man*, or flag-bearer, in consequence of the elongated thread from the back, like a whip, noticed in the text, from which it takes its generic name, signifying a charioteer. The Dutch, it seems, also call it *tafel-visch*, (table fish) from its general use as food.

We have very little to add on the habits of EPHIPPUS, or its subdivisions.

The existence of the disgusting habit of *Eph. argus*, referred to in the text, seems very questionable, several authors asserting, and others denying, or not mentioning it. Spix and Martius, in their Pisces Brasiliensis, mention a nearly similar habit in a fish called *candiru*, a species of *silurus*. "Singulari enim instinctu incitatur in ostia excretoria corporis humani intrandi, quæ cum igitur in iis, qui in flumine lavant, attingit, summa cum violentia irrepit, ibique carnem morsu appetens, dolores, imo vitæ periculum, affert. Urinæ odore hi pisciculi valde alliciuntur, quam ob causam accolæ intraturi flumen Amazonium, cujus sinus hâc peste abundant, præputium ligulâ constringunt, et a mingendo abstinent."

Among the strange figures of fish which have been preserved by Ruysch, Renard, and Valentyn, and which have for so long a time excited the distrust of naturalists, there is none more calculated to produce this sentiment than that which they have designated by the Malay name of *Ikan-Karbauw*, or *Buffalo-fish*, though in fact there are few figures existing more true to nature.

The sharp and curved horns, the protuberance on the top of the head, the compressed and unequal spines, and the singular distribution of colours, all in fact exist and distinguish it even generically. Its dorsal fin, without being so much emarginated as in ephippus, is sufficiently so to prevent its being left in chætodon proper; but its third ray, though raised above the others, and sometimes appearing even augmented by a filament, is not sufficiently elongated to make the fish a

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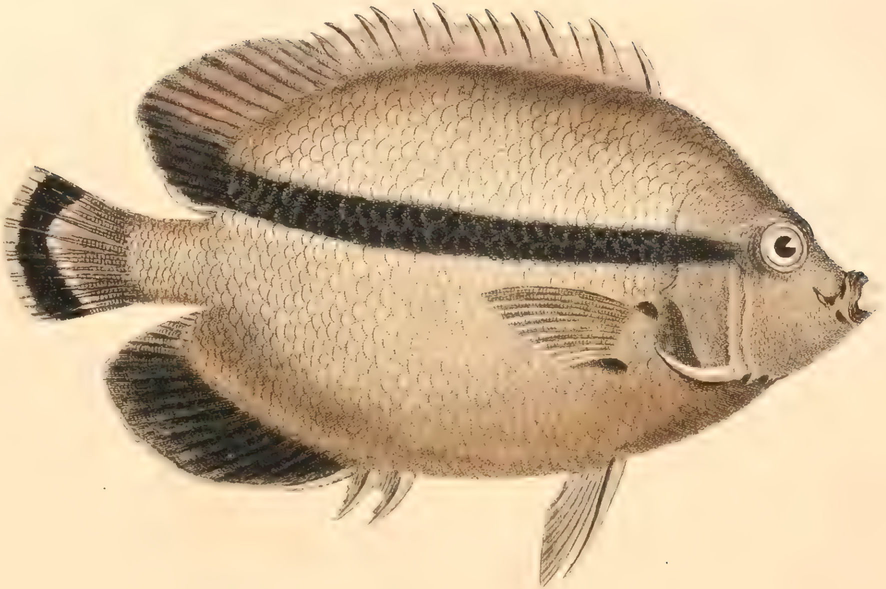

Holacanthus arcuatus. Gray.

[illegible]

heniochus; besides which the protuberance of its cranial crest is a character sufficiently marked to constitute a genus. The Baron has, therefore, so separated it, under the name TAURICHTHYS, translating into Greek its Malay name.

Another species, *T. viridis*, is added by Cuvier, of which we know nothing beyond some silly superstitions the people of Amboyna entertain with reference to it, which are not worth repeating.

The HOLACANTHI are found in both Indies, and are generally reckoned among the best fish for the table, as well as among the most ornamented. *H. ciliaris*, however, is not much esteemed as food; but *H. imperator* is in great request, and is said to eat like salmon. We are told by Ruysch and Renard, concerning the *H. Lamarckii*, that the two sexes never abandon each other, and that if one is taken the other follows the fisherman, and even throws itself into the net, or on the shore. This would indeed be a singular habit in the class of fishes, but in all probability it is referrible only to some insulated fact, and has been observed at the period of spawning.

The holocanthi have a form more or less oval, and the spines of their dorsal fin with but little inequality, are generally thirteen or fourteen in number.

We insert a figure of a species of this genus, *Hol. arcuatus*, Gray, from a specimen in the British Museum.

America produces others, which have but nine or ten dorsal spines, which increase in size from the first to the tenth, and cause the anterior edge of the fin to ascend more rapidly. Their external teeth have always the points smaller at the sides of their principal point, which is the case with but a small number of the preceding, and their suborbital and preoperculum have the edge entire, and without denticulation. In general they have the body higher than the others, and their total appearance is somewhat different. To these fishes the name of POMACANTHUS is restricted by M. Cuvier, which was given by Count Lacépède to all the chætodons, whose preoperculum is armed with a spine or sting, but in which the edge of this bone has not, or does not appear to have any denticulation.

Our countrymen in the West Indies know these fish in general under the names of *flat-fish*, or *Indian-fish;* and the French colonists call it *Portugais.*

The PLATAX have not altogether the same sort of teeth as chætodons. Those of the first rank are trenchant, and divided into three lobes or denticulations, a structure something of which may be observed in many holocanthi, but which is much more decided in the platax. It is only behind these first teeth that there are any formed like a brush, as in the common chætodons.

Psetta is the Greek name of a flat fish which some take for the plaise, and others for the turbot, but which seems to the Baron to be the dab *(Platessa rhombus).* Commerson has given it the masculine form of PSETTUS, and has applied it to a very compressed fish of the Indian Seas, which, with the general characters of the chætodons, has this peculiar one in the ventrals, that but one spine is visible, which is also extremely short.

We may also say that the teeth are rather small and crowded than brush-formed, but there are no palatine teeth.

M. Bosc has seen the PIMELEPTERI follow vessels in the open sea, and assemble in troops round the stern to devour what was thrown out of the ship. They are not easily got to bite at the hook, and they can even carry off the bait without suffering themselves to be taken. Their flesh is esteemed by the French, but our countrymen hold it in no great consideration.

The genus BRAMA furnishes a striking proof of the very imperfect state in which Cuvier found the science of ichthyology at the commencement of his labours. It is a fish of large size, and very remarkable form, extremely common in the Mediterranean, and renowned for its exquisite flavour. There is no mention made of it among the ichthyologists of the sixteenth century. Duhamel and Bloch, indeed, have represented it; but the first confines himself to telling us that he brought it from Provence, and the second has paid so little regard to this assertion, that resting the history of the species only on that of an individual wandering in the English Channel, and cast by chance, in 1681, on the coast of Yorkshire, he supposes that it originally came from the remote north. These two writers are not more fortunate in their classification of this fish than in its history. They make it a sparus, though it presents none of the characters of that genus, nor were other ichthyologists more successful.

The individual taken in 1681, which partly caused all this confusion, is mentioned by Ray in his Synopsis, under the name of *brama marina cauda forcipata.*

It is certain that this fish is a native of the Mediterranean; that it is very abundant upon certain coasts; that it attains to a considerable size, is in high estimation, and is consequently very dear. The species known up to the present time seems essentially peculiar to the Mediterranean. It is but by accident that it has been occasionally found on the coasts of the ocean. Besides the one we have mentioned, and another subsequently taken at Swansea, one was caught at Caen in Normandy, in 1828.

M. Risso tells us that it sojourns in small troops at great depths. In winter it appears to be more full and better flavoured. It spawns in summer, and in that season is tormented with intestinal worms, which cause it to become thin and emaciated.

M. Rudolphi indicates six species of these worms as living in the flesh, or in the intestines of this fish, and M. Cuvier has found in its flesh the *monostoma filicolle* of that learned helminthologist.

PEMPHERIS is a genus which has been discovered in the Pacific Ocean. Among modern observers the first who mentioned one species of this genus was White, who has given a figure of it in his Voyage to New South Wales, and names it *sparus compressus.*

The fish on which the genus TOXOTES has been established, merits this name (Archer) from the peculiar instinctive ingenuity which it exhibits. Although its mouth differs considerably from that of the chelmon in its organization, it knows how in the same manner to shoot drops of water to a great height, three feet and upwards, and to reach, almost without failing, the insects or other little animals which creep on the aquatic plants, or even upon those that grow upon the shore. The inhabitants of many countries of the Indies, especially the Chinese of Java, rear it in their houses to amuse themselves with its manœuvres, and present it ants or flies on threads and sticks within its reach. M. Cuvier received an individual from Batavia, whose stomach was altogether filled with ants. The species is known in the Indian Archipelago, under the Malay name of *ikan-sumpit.*

The SCOMBEROIDES constitute a family, as observed in the text, extremely useful to man.

When considered isolatedly these fish would be easily characterized. The simple separation of the posterior rays of their second dorsal, and of their anal, would suffice for that purpose in the tunny and the mackerel, the typical genera of this family; but these are only the chiefs of a numerous series of genera and subgenera, in which the generic character peculiar to them alters by degrees, and passes insensibly to others. Scales usually so small, that they make the greater part of the skin appear as though it were smooth; vertical fins, not scaly; opercular pieces, without spines or denticulations;

and cœca generally numerous, constitute almost all that can be said in a general way respecting these fishes, and, nevertheless, they all have a sort of family likeness which does not abandon them in any of their modifications, so that they form what botanists would term a family by series or by transition. The majority, however, have the sides of the tail carinated, or armed with scales, or with shields, which are themselves carinated; or the last rays of the second dorsal, or of the anal, are free; or the spinous rays of the first want the membrane which should unite them. Frequently the caudal fin is of a remarkable dimension and vigour. In most of them also the first spinous rays of the anal are separated from the rest of this fin, and form a small and distinct one. But none of these characters is common to them all; and the transition proceeds so far as to approximate them on the one hand to the family of the tænioides, and on the other to that of the acanthuri. In a word, no group of acanthopterygians better proves than the present, that this order, immense in the number of genera and species which it embraces, constitutes at bottom but a single family, and that its divisions are by no means separated by such distinctions as those of many others.

It is possible, however, to find in the midst of this family of scomberoïdes certain groups or tribes better determined than the family itself, which has been done by MM. Cuvier and Valenciennes.

To the first of these tribes belong the most known and the most useful fishes of this family, the tunnies, the germons, the mackerel, which traversing the seas in numerous shoals, and capable of being procured in various ways, give rise to great fisheries which occupy a very considerable portion of labour and capital. Their fusiform bodies, their large and vigorous caudal, their tail contracted, and more or less carinated, make them excellent swimmers, and all their habits are in conformity with this organization.

The first genus is that of the well known MACKEREL, (SCOMBER), comprehending the species most extended in all the European coasts, and the one which answers best the purposes of comparison.

Every body knows that the common mackerel (*scomber scombrus*, Lin.) is a fish of passage, and the one which, after the herring, contributes, in the seas which bathe the north-west of Europe, to the most abundant and lucrative fisheries.

Anderson has endeavoured to trace the migrations of the common mackerel. This fish, he tells us, passes the winter in the north. Towards spring, it coasts along Iceland, Scotland, and Ireland, and enters the Atlantic Ocean, from whence one column passing along Spain and Portugal, enters into the Mediterranean, while another enters the English Channel, appears in May on the coasts of France and England, and passes thence in June to those of Holland and Friezland. This small column having arrived in July on the coasts of Jutland, detaches a division, which, making the tour of that Peninsula, penetrates into the Baltic Sea, and the remainder passing before Norway, return to the extreme north.

There is much of conjecture, however, in all this, taken, as it should seem, principally from the reports of the Dutch fishermen.

Other fishermen, cited by Duhamel, report, that the mackerel pass the winter in different bays or roads of Newfoundland, that they bury themselves in the mud, where they remain until the end of May, a period when the ice allows them to spread in great numbers along the coast, and when they are taken in great abundance, but still retain a disagreeable flavour of mud. It is only in July and August that they become fat and well flavoured.

Admiral Pléville-Lepley, an old naval officer in the French service, who had sailed for upwards of fifty years, communicated to M. de Lacépède an observation which would seem to confirm this account. He assured him that in Greenland, in the little hollows which are surrounded by the rocks, which border all those coasts, where the water is always calm, and the bottom generally consisting of soft mud and fucus, he saw at the commencement of spring myriads of mackerel, with their heads sunk some inches in the mud, and their tails vertically raised above the level, and that accumulations of fish were so great that at a distance they might be taken for sorts of rocks. He supposed that they had passed the winter in a state of lethargy, under the ice and snow. He added, that in fifteen or twenty days after their awaking, these fish were in some measure struck with blindness, and that numbers of them were then taken with nets, but that when their blindness began to be dissipated, the net would serve no longer, and it became necessary to have recourse to the hook.

We also find something similar to this in Schonevelde. Some sailors informed him that at the end of autumn there grows upon the eye of the scombri a pellicle similar to a nail, which causes them to lose their sight during winter, and which falls or decreases in spring. This circumstance causes them to be taken more speedily in the southern latitudes, and they are never fished for in winter.

In fact it is not impossible that this adipose skin, which contracts both in front and behind the orbit of the mackerel, may assume greater breadth and thickness during winter, and cover the greater portion of the eye.

As for the sojourn of the mackerel in the creeks of Greenland, and the sort of lethargy in which they are plunged, we may be the rather permitted to doubt of them, since Otho Fabricius, who resided so long in that country, does not even name the mackerel among the fishes which he saw there.

It is certain that in the Channel, from the month of April, some small mackerel, and without milts, make their appearance, and in Normandy they are named *sansonnets*, and *roblots* in Picardy; that they are full towards the month of May, and are taken in abundance in this state during the whole month of June and a part of July; and that some are there seen when the month of August is pretty far advanced. But they are then empty. Towards the last days of September, and in October, some small ones are fished, which appear to have been born within the year. But all this is very irregular, and it is by no means rare to take mackerel in the Channel in the months of November and December. Their appearance at these unusual seasons is attributed to tempests and foul weather, which proves that they have not retired so far northwards as has been pretended.

Duhamel, like Anderson, has maintained that the mackerel enter the Channel by the west, and follow a contrary route to that of the herrings; and yet in the same page he tells us that the fishermen of Dunkirk take them before those of Dieppe and Havre, and a little farther, that the fishery which takes place at Yarmouth precedes that which the Bretons carry on at the entrance of the channel.

According to Low, large troops of them appear at the Orcades at the end of July and commencement of August.

Schonevelde tells us that the mackerel is pretty nearly unknown on the western coast of Holstein, and that some few only are taken towards St. Jacques, around the island of Heligoland; but he acknowledges that there are some in the Baltic. Even young ones are born there, for the fishermen of Ecreford, on the eastern coast of Holstein, name the little mackerel, about a palm long, *prieglers*.

What renders the account of Anderson, respecting the grea voyages of the mackerel more doubtful, is, that the catching o this fish commences in the Mediterranean at the same time as in the North Sea, and in the Channel, and even sooner.

They are taken at Aiguemortes from the month of April to the month of August. All along the coast of Languedoc, the fishery takes place in June, July, and August. At St. Tropès, and Fréjus, in Provence, they are found from the month of May, and sometimes as late as October. M. Risso assures us that they constitute abundant fisheries in spring, in the neighbourhood of Nice. Even in the Black Sea, along the coasts of the Taurica Chersonesus, large troops of them make their appearance in spring and during the summer, all the individuals of which, even the smallest, are full of eggs or milt. They come from the west, and the sea-birds, attracted probably by the brilliancy of their colour, follow them and make them their prey. They do not penetrate into the sea of Azof. They proceed, moreover, farther south than the Straits of Gibraltar, for some were brought by Adanson from the Canaries. None, however, have been seen from a more southern latitude.

In general in the Mediterranean, the mackerel is small and dry, and is considered inferior to that which is found in the ocean and British Channel; but M. Cuvier suspects that this evil reputation is owing to two other species being mistaken for it, which have natatory bladders, and which we shall presently notice.

The name of *mackerel* (macarellus), is found in Albertus Magnus, and in Arnaud de Villeneuve. Authors are not agreed concerning its etymology. Some derive it from *macularius* or *maculariolus*, in consequence of its spots; others from μακαριος, in consequence of its goodness. But there is no likelihood that a word used at all times in the remotest parts of the north should be derived from any southern language; more particularly as in most of the ports of the south this word is not known.

Among the fish which the ancients were accustomed to salt, there were some small species known by the name of *scomber*, *colias*, and *cordylla*, and which were comprised under the generic name of *lacertus*. There is every reason to believe that these were the common mackerel and its approximating species. All that is said of them proves that they were common and of small size. *Colias lacertorum minimi*, says Pliny. Lacertus was, therefore, evidently a name common to many species.

One of the most curious facts in ichthyology, and the most inexplicable in comparative anatomy, is, that in fishes of the same genus, and so similar in all the details of their organization, that very great attention is necessary to distinguish their species, some possess a natatory bladder, and even a tolerably large one, while others are destitute of it. What necessity of nature can require this organ in one and not in the others? What cause can have produced it? These are indubitably very great problems, either in the study of final causes, or in the philosophy of nature in general.

This fact, which is observable in more than one genus of this family, has been discovered in that of the mackerel by M. de Laroche.

This interesting observation was made by this gentleman in a voyage to Iviça in 1808, which he undertook in company with M. Biot, and by which ichthyology has derived much advantage. He brought back to the Museum of Natural History some specimens of these mackerel destitute of the swimming bladder, and at the same time some of the common mackerel, taken in the same latitudes, and he described the fact in a memoir on the fishes which he had collected in that voyage.

An individual of the first of these species (*scomber pneumatophorus*), placed by the side of a common mackerel of the same size, excites astonishment by the resemblance of its form, and the proportion of all its parts. But when it is regarded with attention, it presents differences which would suffice to characterize it, even independently of the consideration of its interior structure.

This species is common upon the coasts of the Balearic Islands. It lives in troops near the shore. At Iviça it is known by the name of cavallo.

Besides this first small species with natatory bladder, there is another larger one in the Mediterranean (*scomber colias*), which perhaps may be only the same in a more advanced age, though, nevertheless, it appears to present some characters tolerably marked.

M. Risso considers this as the *scomber colias* of Gmelin, and the same which is called at Nice *cavaluco.* It is to be recognized by certain brownish marks in the abdomen. Its weight scarcely amounts to four pounds, and its flesh is whitish, but much inferior to that of the common mackerel.

The genus of the TUNNY (THYNNUS) which also comprehends the thunninæ, the orcynus or germon, and the bonitoes with striped belly, differs from that of the mackerel by a remarkable disposition of the scales of the thorax, which are larger and duller in colour than the others, and form around this part of the trunk a sort of corslet which is divided behind into many points. There are also other characteristic differences indicated in the text.

The common tunny (*scomber thynnus*, Lin.) as large and beautiful as it is useful and agreeable.

The tunny is one of the largest sea-fishes. Aristotle speaks of an old individual which weighed fifteen talents, or twelve hundred pounds, and which measured two cubits and a palm from one point to the other of the caudal fin. This measure too, is a correction of Gaza in his first editions, and after Pliny. The majority of the manuscripts of Aristotle say five cubits, and Hardouin, always prone to paradox, believed that it was Pliny who ought to have been corrected.

Five cubits for this part would give a length of at least twenty or twenty-two feet for the entire fish.

In Sardinia when it weighs less than a hundred pounds, they give it the name of the *scampirro,* a diminutive derived from *scomber*. One from a hundred to three hundred pounds they consider as but a half tunny (*mezzo-tonno*). Some weighing a thousand pounds are not rare. Cetti asserts that they are taken sometimes of the weight of eighteen hundred pounds, and he adds that the largest are always males, which, according to his own remark, would be the reverse of what is observed in most other fishes.

The fishery of the tunny dates from the highest antiquity. Enthidemus even attributes some verses to Hesiod in which he describes the trade and exportation of it. But Athenæus, who quotes them, proves at the same time that they must of necessity have been the production of a much later poet.

It was more especially at the two extremities of the Mediterranean, at the places where this sea contracts its channel, and where the migratory fish are forced to come more closely in contact with each other, that the largest tunny fisheries took place.

In the East the Black Sea presented these fish with an abundant degree of aliment, in consequence of the number of rivers which run into it. They repaired thither in crowds in the spring time for the purpose of spawning, and Aristotle even believed that they did not multiply elsewhere. They remained there during the summer, and it was on their passage to the Bosphorus, that such rich captures were made of them. According to the very detailed account of Strabo, their reproduction took place in the Palus Mœotis. They followed the coast of Asia Minor, and the first were taken at Trebizond and Pharnacia; but they were then but small. At Synope they had already attained a size large enough for salting, and that town, built upon an isthmus, and admirably situated for this fishery, derived immense profits from it.

But it was more especially the city of Byzantium which was enriched by this fish. The shoals of them that entered into the Bosphorus, near Chalcedon, met with a white rock which terrified them, and forced them to turn on the side of Byzantium, and to enter into that gulf, now the port of Constantinople, so that all the advantage of this fishery fell into the hands of the Byzantians, the Chalcedonians reaping little or no profit from it. It was, says M. Cuvier, in consequence of this abundance of tunnies, that the gulf in question received the name of the *Golden Horn*, and the oracle of Apollo termed Chalcedon the *City of the Blind*, because its founders did not recognize this inferiority in the site they had chosen. But Gibbon, with more probability, tells us that "the curve which it describes might be compared to the horn of a stag, or as it should seem with more propriety, to that of an ox. The epithet *golden* was expressive of the riches which every wind wafted from the most distant countries into the secure and capacious port of Constantinople." He adds, indeed, that "the river Lycus, formed by the conflux of two little streams, pours into the harbour a perpetual supply of fresh water, which serves to cleanse the bottom, and invites the periodical shoals of fish to seek their retreat in that convenient recess." A little farther on he tells us that "the Propontis has ever been renowned for an inexhaustible store of the most exquisite fish, that are taken in their stated seasons without skill and almost without labour." We are also informed in a note, that among these the *Pelamides*, a sort of tunnies, were the most celebrated. These, according to M. Cuvier, were the young tunnies of Chalcedon, which Aulus Gellius tells us were the most esteemed of the species.

This prodigious quantity of fish still arrives at Constantinople at the present day, as in the times of the ancients.

Gyllius speaks of them in terms well calculated to excite astonishment.

"They abound there," says he, "more than at Marseilles, at Venice and Tarentum. Twenty vessels might be filled with a single cast of the net. They may be taken without nets, and with the hand. When they ascend towards the port in crowded troops they can be killed with stones. The women take them only by suspending from their windows a basket with a cord. In fine, without there being any occasion to bait the hooks, a sufficient quantity of pelamides may be taken to provision the whole of Greece, and a great part of Europe and Asia."

Dupper, in his description of the Archipelago, and very recently M. von Hammer, in that of Constantinople, confirm this account of Gyllius. "The sea-fish of Constantinople," says M. von Hammer, "are the first in the world. The Bosphorus swarms with them. This is the reason why we see in the medals of Byzantium, a dolphin accompanied by two other fishes." "How unfortunate it is," very properly exclaims M. Cuvier, "that of so many Europeans who pass a part of their lives in that great capital, none should employ himself in determining with precision these numerous species, and informing us of the periods and directions of their passages."

The tunny fishery was still more ancient in the West. The Phœnicians had established it very early on the coasts of Spain, and prosecuted it with great activity, both without and within the columns of Hercules. Accordingly we find the tunny appear on the Phœnician medals of Cadiz and Carteia.

From that period this species of industry was extended and perpetuated along these coasts. The salted preparations of fish of Spain, as well as that of Sardinia, were considered in the time of the Romans as much more tender, and of a more agreeable flavour than those of Byzantium. These preparations sold too at a higher price. They were known in general under the name of *saltamentum Sardicum*. Their savoury quality was attributed to the quantity of acorns which fell from a small species of oak very common on these coasts, and the people were led to believe that it was at the bottom of the sea itself that the oaks grew which produced these acorns, but which in all probability are nothing but fucus.

The tunnies which removed farther towards the straits of Gibraltar, became more and more thin, because they no longer found this sort of aliment.

The middle of the Mediterranean, in the spot where it grows narrow, between Italy and Africa, also yielded very abundant fisheries of these tunnies.

Ælian speaks of those which were carried on by the Gauls, and the inhabitants of Marseilles, with strong hooks of iron, and of the great apparatus of nets employed by the Italians and Sicilians.

Archestratus, in Athenæus, extols the tunnies of the mouth of the Metaurus in the Adriatic, and those of the coasts of Laconia.

Strabo, in his Geography, carefully marks the places where men were stationed to give notice of the arrival of these fish, just in the very same manner as is done in our own times. These stations were Papulonium, or Piombino, Porte-Ercole on the coast of Etruria, whither they were attracted by the shell-fish, and the Cape of Ammon, on the coast of Africa. These kinds of watching places were called *tunny-scopes*, (θυννοσκοπειον).

The fishery was carried on very nearly in the same way as in our days. The description given us by Ælian of that which took place along the coasts of the Euxine, entirely resembles what is reported by Duhamel of the tunny fishery as practised at Collioure.

Particular names were given to the tunnies of different ages. The *scordyla*, or as it was called at Byzantium, *auxis*, was the young tunny when it first issued from the Euxine Sea in autumn. The *Pelamis* was the tunny in more advanced age, when it returned to that sea in spring.

The very large tunnies bore the name of *Orycnus*, and there were some so gigantic as to have been ranged among the cetacea.

These large Orycni, according to Dorion, in Athenæus, were considered to come from the ocean. This was the reason why there were more of them near the coasts of Spain, and in the Tuscan Sea, and it was supposed that they did not return into the more Eastern Seas.

In modern times, the tunny fishery, without having diminished in product, is almost concentrated in the interior of the Mediterranean. It is no longer carried on, on a grand scale, at Constantinople, nor on the Black Sea, since the establishment of the Turks in those fine countries. The fisheries of the coasts of Spain without the straits were supported for a longer time. Those of Conil, near Cadiz, and of the Castle of Sara, near Cape Spartel, were particularly celebrated, and produced great revenues to the Dukes of Medina and Sidonia, their privileged proprietors. More than five hundred men were employed in them; but they are now fallen into decay, partly through bad management, and partly, as it is said, because the earthquake which destroyed Lisbon in 1755, has changed the nature of the coast, and determined the tunnies to seek in preference the shores of Africa.

At the present day it is in Catalonia, in Provence, in Liguria, in Sicily, and in Sardinia, that this fishery is most actively carried on, and yields the most abundant results. It is principally performed in two ways; by the common tunny-net, and another of a peculiar nature, which the French call *madrague*, and for which there is no English equivalent.

In the first method, when the sentinel, who is posted in an elevated situation, has given the signal that a shoal of tunnies are approaching, and from what quarter they come, numerous boats set out under the command of a chief, range themselves in a curve-line, and form, by joining their nets, an enclosure which terrifies the tunnies, and which is drawn closer and closer by adding fresh nets within the first, so as always to bring back the fish near the shore. When there remain but a few fathoms of water, a large and final net is spread, which has a sleeve, that is, a bottom lengthened into a cone, and which is drawn towards the land, thus bringing along with it all the tunnies. The little ones are then taken out with the hand, and the large, after they have been killed with poles. This fishery practised on the coasts of Languedoc, sometimes yields at a single cast two or three thousand quintals of these fish.

The *madrague*, which the Italians call *tonnaro*, is a much more complicated engine. It is, as Brydone calls it, a sort of aquatic castle, constructed at great expence. Some large and long nets held vertically by corks at their upper edge, and by leads and stones at the lower, are fixed by anchors, so as to form an enclosure parallel to the coast, of many hundred toises in extent, sometimes of an Italian mile in length, divided into several chambers by transverse nets, and open on the side of the land by a sort of door. The tunnies, which, in their progress, proceed along the coast, pass between it and the *tonnaro;* when arrived at the extremity of the latter, they meet with a large net placed crosswise, which closes the passage against them, and forces them to enter into the tonnaro through the aperture which is made in it. When they have once penetrated thither, they are constrained by divers means to pass from chamber to chamber, as far as the last, which is named *corpou* (chamber of death). A horizontal net there forms a sort of floor, which a great number of sailors, who have arrived in the barks, lift up so as to raise the fish along with it, as far as the surface. They then give battle to the tunnies on all sides, striking them with hooked poles and all sorts of similar weapons: an imposing spectacle which often attracts a great number of curious observers. It is one of the greatest amusements of the rich Sicilians, and at the same time one of the first branches of commerce in their island.

The tunnies spawn in the Mediterranean, and the young come forth there in abundance, and grow with an astonishing degree of rapidity.

A Sicilian nobleman, Don Carlo d'Amico, has made some curious observations on this subject, and which appear tolerably precise. The tunnies which are taken at the commencement of the fishery on their arrival in April and the first days of May, have no eggs developed. In a few days their ovaries enlarge; from fifteen ounces that they weighed at first, they come to weigh twelve pounds and a half. After the 15th of June, animated by the desire of reproduction, they are seen in continual motion, leaping in the gulfs and bays, and ejecting their eggs into the seaweed, where they are fecundated by the males. In the month of July the new-born tunnies do not yet weigh more than an ounce and a half, and are named *nunzintuli;* in the month of August they weigh four ounces; in the month of October they weigh thirty.

It is almost certain that in almost all the points of this sea, the tunnies show themselves pretty nearly about the same time, and without its being possible to say that they pass at first through certain tracts, and then arrive afterwards at others. But on the other hand it is not ascertained that on each coast the tunnies do not follow a certain direction at their arrival, and another at their departure, and that the tonnaros disposed for both those fisheries should not be regarded as more or less favourable, according as they can receive the fish sooner or latter.

This was the circumstance which caused the ancients to attribute such long migrations to the tunnies from one sea to another, but which we shall find it necessary to reduce to much more limited voyages.

Pennant tells us that the tunny frequents our coasts, but not in large numbers as in the Mediterranean. They are not rare in the little gulfs of the western coasts of Scotland, where they pursue the herrings, and frequently tear the nets. As soon as they are perceived a hook is set for them, baited with a herring. The tunny, when taken, makes very little resistance. The Scotch fishermen name them *mackerel-stour* (large mackerel), derived from the Danish word *stor*, which signifies *great*. In England they are named *Spanish mackerel.*

The tunny is in general a timid animal; any thing extraordinary that it meets with terrifies it. Noise produces the same effect, and a hunting-horn is sometimes successfully employed to drive it into the nets.

The *Thynnus pelamys* is a tropical species mentioned by almost all navigators under the name of *bonito*, and very celebrated for the chase which it gives in large troops to the flying-fish. It principally feeds upon them and on the calamaries, but does not reject other fish.

This species more than any other is tormented by intestinal worms of various sorts. Commerson represents it as very miserable in this point of view. He has found in the intestines ascarides, and tæniæ, fascioli under the peritoneum, and in the stomach filaria, and other species. We find similar observations in the manuscripts of Solander.

The next species which we shall briefly notice is a tunny called *Alalonga*, in Italy, and, in the gulf of Gascony, *germon.*

A very singular fact in the history of ichthyology is, that this European fish, so large, and so remarkable for its characters, and the goodness of its flesh, and which on several coasts of Europe constitutes the object of considerable fisheries, has scarcely been known by ichthyologists. Those of the sixteenth and seventeenth centuries have not noticed it at all; and even many subsequent writers have either figured it without any description, or in describing have erroneously referred it to other species.

The germon is considered to come from the great Atlantic into the gulf of Gascony. It arrives in numerous shoals towards the middle of the month of June. Sometimes the individuals are to be seen from the month of May, and occasionally to be met with even in October.

It gives chase to all fishes, to the mullets, the sardines, and the anchovies. It pursues the flying fish, and M. d'Orbigny has found exoceti in the stomach of those germons, which he himself has taken.

It is believed that the name of *germon* is a corruption of our English *war-man*, that it has been in use in the isle of Yeu from the period when our countrymen were in possession of Guienne and Poictou, and that it is referrible either to the large pectorals of the fish, which have the appearance of offensive weapons, or to its habits of warfare against other fish.

Of the genus AUXIS, the common species (vulgaris), belongs to the Mediterranean, and was not distinguished before the time of MM. Rafinesque and Risso. The last of these naturalists informs us that it is named at Nice *bonitou*.

The CYBIA are found in both oceans; many attain to a great size, and are very much esteemed.

The *Cybium Commersonii* has been described by the indefatigable voyager whose name it bears, in 1769, at the isle of France, where it is commonly called *tassard*, or *bécune*, names imported from Martinique, where they appertain, one to a different cybium, and the other to the sphyræna. This individual was twenty-one inches in length, and weighed twenty-six ounces. But there are some much larger, three feet, and even six feet long, according to M. Leschenault. The fishermen of Pondicherry name it *vassili-massi*, and say that it swims with extreme rapidity. It is excellent eating. Commerson found in its stomach several small fishes, a proof of voracity which the form of its teeth sufficiently indicates.

The *cybium guttatum* is an East Indian fish in great estimation among the Europeans. The English of Calcutta name it *seer-fish*.

To eat it in perfection it must be about two feet long. Under fourteen inches it is more dry than our worst mackerel, and when it passes three feet it becomes insipid.

This fish, it appears, remains at Tranquebar, in the submarine rocks, and does not show itself at the surface but from the month of January to that of March. Individuals are taken three feet and a half in length. It is common enough at Malabar, and very good eating.

It is very subject to the attacks of a species of wood-louse and of a *lernæa* of a particular species which penetrates into its flesh.

After the cybia come some fishes equally elongated, part of which constitute the genus THYRSITES. The *thyrsites atun* is from the Cape, where it appears to have been observed by Euphrasen. It inhabits the sea which surrounds the Cape. During the winter of these latitudes it repairs to the bank of the Needles. Its flesh is white, easily divisible into flakes, and somewhat resembles that of the cod in flavour, but it is still lighter. It is prepared by being cut into slices and fried.

This fish is so voracious, that a piece of red cloth attached to the hook is sufficient to catch it. The fishermen of the Cape form, with stripes of leather and a piece of lead, a sort of image resembling a calamary (loligo) which they throw out to a considerable distance, and draw back again quickly.

The GEMPYLUS is a genus composed at present of three species: the *G. serpens*, inhabits the Atlantic; the *G. prometheus* is found in the vicinity of St. Helena; and the *G. coluber* in the seas surrounding New Holland. The specimen seen by M. Cuvier was eleven inches long, but the species grows much larger.

It is after the gempylus and thyrsites that M. Cuvier, in his great work, places the genera LEPIDOPUS and TRICHIURUS, of the tribe tænioides of the Règne Animal, and we think it right to follow his example here as the analogy is most striking.

It is a most extraordinary circumstance, that a fish so generally met with, so handsome, so large, and so remarkable in all respects, as the great *lepidopus* of our European Seas, should have remained unknown to naturalists even to the end of the eighteenth century, and that for a long time after it should have been described successively by several writers, each of whom has believed it to be new, and was totally unacquainted with the labours of his predecessors.

If we figure to ourselves a large and broad riband of silver, swimming in undulations, and sending forth in its motions beautiful reflections of light, we shall have an idea of the effect produced by the *lepidopus argyreus* when it is living in the waters of the sea.

This fish constitutes an article of food, and its flesh is even fine and delicate. According to M. Risso, it is in April and May that it approaches the coasts. It is then taken by the drag-net. Its ordinary sojourn is at a moderate depth, where it lives isolatedly. Its female is full of eggs in spring.

According to the fishermen who caught an individual on the coast of Devonshire, which has been described by Montagu, it swam with astonishing velocity, and kept its head out of the water. It was killed by a blow of an oar; but it was such a rarity even in Devonshire, that it was publicly exhibited till decomposition took place.

M. Rafinesque thinks that the silvery powder which covers this fish might be employed to colour false pearls, and tells us that he himself made from it an ink of the colour of silver.

This lepidopus is tormented by many species of intestinal worms. Montagu found under the skin, along the dorsal region, some echinorhinchi, and on the rest of the body abundance of ascarides, rolled into a spiral form. M. Holten has represented a tetrarhyncus, which was also found in great quantities by M. Cuvier in the abdominal cavity, as well as an equal multitude of filaria. They even filled certain portions of the mesentery and the peritoneum.

The name of TRICHIURUS, which means *hair-tail*, was not given to this genus until 1757, in the second edition of the *Systema Naturæ*. It had previously been called *lepturus* by Linnæus, from Artedi, who first established the genus, and *gymnogaster*, from Gronovius.

The trichiurus of the Atlantic, (*lepturus*) was very erroneously supposed to be a fresh-water fish, and found in the lakes of South America. It is, however, now incontestibly established by M. Cuvier, that the trichiurus is taken in the sea. His numerous correspondents from a variety of places have confirmed this fact beyond all controversy[1].

It is common on the coasts of Porto Rico, and also on those of Cuba. The Spaniards of Cuba name it *sable* (sabre), and those of Monte Video, *Pes-espada*, (sword-fish). The latter name is also given to it by our countrymen in Jamaica. Dr. Mitchill calls it *hair-tail*, which is only a translation of its scientific name, and would seem to prove that the species is not so common at New York as in the Torrid Zone. It appears to be among the small number of fishes that cross the Atlantic, as M. Cuvier received one from Senegal, not distinguishable from those of America.

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[1] It is proper to acquaint the ichthyological student that M. Lacépède's eloquent account of this fish, which he supposes to be of the fresh-water, is totally inapplicable to it. He has been implicitly followed in the "Dict. des Sciences Naturelles" (art. *Ceinture*), where the Asiatic species are also confounded with *lepturus*.

Bloch, and after him, Grueber, Lacépède and Shaw, speak of a trichiurus of the East Indies, which from their description, would be very different indeed from the one just mentioned, and more especially if it possessed an electric faculty analogous to that of the gymnotus and torpedo. This last property would render it eminently remarkable. Accordingly MM. de Lacépède has not failed to call it the *electric trichiurus*, in which he has been followed by Shaw. But it appears that the characters and properties announced with so much assurance, rest only on a bad figure given by Nieuhoff, and a transposition of a part of the text which has no reference to the figure, nor to any trichiurus.

The *trichiurus haumela* is an Asiatic species, and the one which most resembles the American, though by no means the same. It comes from the coasts of Malabar, &c.

The *T. savala*, is still more strikingly distinguished. This was also received from Malabar by M. Cuvier; and M. Dussumier tells us of both species, that they are rare in the month of February, but become very abundant in April and May; that many of them are then salted, and that they form an important article of diet for the Indians during the bad season, when the sea, driven with violence upon the coast from the month of June to September, will not allow their vessels to go out to fish.

When fresh they are not esteemed, and are never served on the table of Europeans. The same observer fully confirms the erroneousness of their opinion who attributed electric virtues to these fish. He never heard such a thing mentioned, nor met with a person who had any knowledge of it. This would be impossible, were there any foundation for the existence of such a property. The Savala also inhabits the coasts of China.

We insert figures of three species in the British Museum, under the respective names of *T. armatus, T. muticus,* and *T. medius,* sufficiently to be distinguished by the form of the head and under jaw. They are described by Mr. Gray in his Zool. Miscel.

We now turn to the genus XIPHIAS.

The only species known of Xiphias proper (*X. gladius*), has received names from all nations, ξιφιας, *gladius, epée, dard, pesce-spada, schwerd-fisch, sword-fish,* sufficiently indicating the most striking trait in its conformation, the trenchant and pointed lamina, which prolongs its muzzle, and menaces every thing which it approaches. The name of *Empereur*, which it bears in Provence, and on the coast of Genoa, comes, as they say, from the relation which it exhibits to those figures in which the Cæsars are represented sword in hand.

Aristotle long ago observed that the tunnies and the sword-fish, towards the rising of the dogstar, are tormented with the *œstrus,* which he somewhat vaguely describes as a sort of little worm, of the figure of a scorpion and the size of a spider. This oestrus, which occasions them such severe pains that they cast themselves on the shore, or at least upon vessels, is a parasite of the family of Lernæa, the *pennatula filosa* of Gmelin, or the *penilla* of M. Oken.

Belon remarks not only the resemblance between the tunny and the xiphias, but assures us that the Provençals of his time prepared them in the same manner, and made them subservient to the same uses.

This species comes to an enormous size, so much so that the ancients were induced to range it in the cetacea. With them, however, be it observed, that the word cete only signified very large fishes. It is not rare to find individuals of this species ten or twelve feet in length, and some have been mentioned of eighteen or twenty.

So remarkable an animal in size and conformation as the sword-fish could not have been unknown at any period. All the ancients speak of it in a manner that clearly proves their intimate acquaintance with it. They describe its weapon, the blows which it inflicts, the combats which it sustains, the attacks which are made upon it, the stratagems by which it is lured to destruction; and they describe them pretty nearly in the same style as more modern writers.

The sword-fish, especially when adult, sometimes departs from the Mediterranean, and ascends considerably to the north. It appears along the coasts of Spain upon the ocean, and is occasionally taken on those of France. Pennant mentions one which was taken on the coast of Caermarthen, whose sword was three feet long. It has been seen in the German Ocean, on the coasts of Holstein; and Schonevelde informs us that small ones are sometimes taken in the gulf of Ekeford on the eastern coast of that country. It even enters farther into the Baltic, and has been seen at Lubeck, on the coasts of Mecklenburgh, of an enormous size.

It seems doubtful whether or not it is found on the American coasts, and it is not mentioned by Mitchill in his account of the fishes of New York. Doctor Smith, however, in his "Fishes of Massachusetts," gives a full description of it, and assures us, on the authority of Mr. Daggett, an old pilot, that it is by no means uncommon off that shore. There is no notice of it in those authors who have written on the fish of the more southern latitudes of America, nor in those who have treated of the fishes in the Indian Ocean. But like many others of the Mediterranean it appears to follow the coast of Africa as far as the Cape.

Among the habits of the sword-fish, is mentioned that of usually going in pairs, a male and a female. Pliny, on the testimony of Trebius Niger, relates, that near a place on the coasts of Mauritania, named Gotta, not far from the river Lixus, some vessels were pierced by the beak of the xiphias, and sprung a leak in consequence. This fact has been contested, and yet one exactly similar is recorded by Cornide, of a Spanish vessel, on the coast of Gallicia, which was on the point of perishing from having been pierced by one of these fish, and he assures us that the plank, and the beak which was implanted in it, are preserved in the Royal Cabinet of Madrid. We may well conceive that such accidents cannot happen except to slight and old vessels. But it frequently occurs that the beaks of these fishes are found broken in the keels of ships.

The fishery of the xiphias, according to Brydone, is more diverting than that of the tunny. A man mounted on the mast of a vessel, or on a rock in the neighbourhood, gives notice of its approach. It is attacked with a small harpoon attached to a long line, and frequently struck at a considerable distance. It is precisely the whale fishery in miniature. Sometimes the pursuit is continued for some hours before the fish is caught. The Sicilian fishermen, who are remarkably superstitious, chaunt a sort of stave, which Brydone thinks is Greek, and which they regard as a charm, to entice the xiphias to their boat. It is the only bait which they employ. They pretend that it is of most marvellous efficacy, and that it forces the fish to follow them, whereas, if it should unfortunately hear one word of Italian, it would instantly dive into the water and be seen no more.

The flesh of the young sword-fish is perfectly white, compact, firm, and of an excellent flavour. That of the old ones assumes other qualities.

The HISTIOPHORI, or *sailors*, (voiliers) differ from the tetrapturi by the great height of their dorsal fin. Though very anciently described, they have been for a long time mistaken by methodical naturalists. They approximate most to the xiphias.

The *Histiophorus Indicus* is named by the Malays of Amboyna *ikan-layer* (fan-fish), and the Dutch call it *zeylvish* (sail-fish). We are in fact informed that it raises and lowers its dorsal like a fan, and employs it like a sail. Some of these fish are very large, and, according to Bernard, comparable to small whales; and when they raise their sail they are distinguishable for a league at sea.

This fish is very large, and of an excellent flavour. Shaw relates a fact altogether similar to that which we have mentioned of the sword-fish. It is, that one of these fishes had sunk its beak into the keel of a vessel with so much force that it was broken and remained fixed there, a fortunate accident, without which, the vessel would infallibly have leaked.

M. Cuvier thinks that those fish take the vessels for whales or other large cetacea, their natural enemies, and employ against them those arms with which they are provided by nature.

The *Histiophorus Americanus*, is found on the South American coasts, and also on those of Africa in the Atlantic. Marcgrave found many entire fishes in its stomach. Pison tells us that its beak has many times been found sunk in the keels of vessels.

Of the genus NAUCRATES, the common species, *naucrates ductor*, or the *pilot*, so named from the habit which it has of following or accompanying vessels, or from that which is attributed to it of conducting the shark, is a fish very analogous to many of the preceding. It would seem to have been the Pompilius of the ancients: a fish, which, according to them, indicated the route to embarrassed navigators, which accompanied them to the neighbourhood of the land, and announced their approach to it by quitting them. From this habit it derived its name (*πομπη comitatus*). They regarded it as sacred. What they tell of the external characters of this Pompilius, of its resemblance to the pelamys, and its variegated colour, accords perfectly well with the *naucrates*.

The fable of this fish serving as a guide to the shark has not been transmitted to us by antiquity, though it is certainly an imitation of what Pliny says concerning a small fish, the conductor of the whale. It appears to have been applied to the shark in modern times by navigators. At least the ichthyologists of the sixteenth century say nothing of it in their history of that Squalus; and the first mention of it is in the description of the Antilles, by Dutertre, printed in 1667. But since that time it has been carefully repeated by a crowd of travellers of all nations, and Osbeck makes it a subject of pious reflection on the admirable ways of Providence.

Others confound or mingle the history of the *remora* with that of the pilot, and talk of pilots being attached to the back of the shark. The fact appears to be reduced to this, that the pilot follows vessels like the shark, but with still greater perseverance, to obtain what falls from them, and that the shark does not attack it, or is not sufficiently prompt in its motions to make it its prey. It is thus that Dutertre has explained their apparent alliance, and his assertion is confirmed by the best observers. M. Bosc, who has seen hundreds of these fish, assures us that they always keep at some distance from the shark, and that they swim swiftly enough in all directions to be certain of avoiding it. If any food be thrown out to them they stop to seize it, and abandon both the vessel and the shark, which can leave no doubt respecting the object which attracted them.

M. Geoffroy, however, in a memoir on the mutual affection of some animals, in the annals of the Museum, tells a story of two pilots which seemed to lead, and with no small degree of pains and exertion, a shark towards the bait which was laid for him. Admitting, however, says M. Cuvier, that they have all the influence over the shark, which the author in question supposes, it must be owned that they rendered him a very ill service, and that in this instance they would better have deserved the epithet of traitors than that of pilots.

These fishes suffer themselves to be conducted to immense distances by their ardent pursuit of ships. Dutertre says that he saw one of them which followed his vessel for more than five hundred leagues. It may be observed that the name and habits of the pilot have been applied to other fish. It is found in all parts of the Mediterranean, is spread through the Atlantic, and even comes into the Channel. It has also been supposed that it has been seen in the Indian Ocean. With its habits of following vessels with so much pertinacity, it would not be astonishing if the pilot should be found in latitudes very remote from its original habitat.

RHYNCHOBDELLA, MACROGNATHUS, MASTACEMBELUS, and NOTACANTHUS, are all fishes of the fresh waters of Asia, and have been found from Syria as far as the Sunda islands, the Moluccas, and China.

Their muzzle furnishes them with a delicate organ of touch, which it appears they employ in seeking in the mud for small worms, and other slender substances on which they feed. They are generally considered as fish of good flavour, whose flesh has some resemblance to that of the eel.

The SERIOLA is a genus very much approximating to the *Caranx*, of which we shall speak presently. The species *Seriola Dumerilii* is called *Caranx Dumerilii* by Risso. This fish attains to the remarkable weight of from one hundred and sixty to two hundred pounds, and inhabits the inaccessible places of the sea of Nice, where it was first observed by M. Risso. It does not approach the shores but when it appears to be attracted thither by hunger. Its flesh is reddish, firm, and of an exquisite flavour.

Commerson was the first who designated, under the name of

Caranx, certain fish which had been previously confounded with the scombri. The name is derived from the Greek word *καρα* (caput) because the majority of the species of this genus are remarkable either for the size of the head, or the brilliancy of its colours.

The *saurel*, or *bastard mackerel*, *caranx trachurus*, inhabits the Mediterranean Sea, the Pacific and the Atlantic Oceans. The ancients were probably acquainted with it, and Athenæus and Oppian appear to have spoken of it under the name of *τραχουρος*. On the coasts of the Mediterranean, and towards the mouth of the Charente, it is vulgarly called *gascon*, *gasconet*, *chicaron*, &c.

In spring it approaches the shores in numerous troops to spawn. Great numbers are then taken both by the line and the net. Its flesh is inferior in flavour to that of the mackerel. In the north, however, it is rather in estimation. But at Nice, Rome, and on the coasts of the Mediterranean, it is entirely abandoned to the lower classes of people. In the time of Belon it was greatly in demand at Constantinople, for the *garum* which was made of its intestines.

Koempfer appears to have met with this fish in Japan, and Marcgrave in Brazil. In the Baltic Sea it is seldom above a foot in length, but in the Mediterranean it frequently attains to more than three.

A fish of this genus, now forming the subgenus *Carangus*, is so called at Martinique, and in the Archipelago of the Antilles. Pere Labat informs us that they name *Carangues franches*, those which are nearly two feet in length, one in height, and four or five inches in thickness, while those which are smaller are designated by the name of *Carangues lunaires*. The same observer tells us that it is one of those fishes which leap the best, and which often by the assistance of this faculty escapes from the nets where it has been retained. Its strength is so great that it breaks the best lines, when it is taken by the hook. Its flesh is white, tender, fat, and very much esteemed, and Ray assures us that it is preferable to turbot. It is also asserted that the carangues enter by night into the rivers.

On VOMER, generally, we have nothing of sufficient interest to add to the text.

Zeus proper is established upon a fish which the French call dorée, from the general tint of the body, which is a mixture of green and gold. It was also called *forgeron* in French, and in Latin *faber* (blacksmith), from this external covering, having a smoked appearance by means of some black tints on the back and other places.

It is also called in French *Poisson St. Pierre*, from an odd notion that it was a fish of this species that St. Peter caught at the command of his Master, to take from its mouth a piece of money for the purpose of paying the tribute. On this supposition, it is believed that all the individuals have, on each of their sides, a round and black spot, because the fingers of the Prince of the Apostles were applied upon an analogous place.

The modern Greeks call it the *fish of St. Christopher*, or χριστοφορον, from one of their pious legends, according to which, St. Christopher, in traversing the sea with Jesus Christ upon his back, seized hold of this fish, and left upon its sides the impression of his fingers. From a passage in Athenæus, and the researches of Rondelet, it appears that the ancient Greeks named it χαλκευς.

In the same manner as certain balistæ, cotti, and triglæ, it can compress its internal organs rapidly enough to cause gases violently pressed to issue forth through the apertures of the gills, come in collision with the opercula, and thus produce a slight noise like a sort of grunting.

The zeus or dory is a very excellent fish, found both in the Mediterranean and the Ocean. It sometimes weighs more than fifteen or sixteen pounds. It preys upon timid fish when they approach the shores to deposit or to fecundate their eggs. It is very bold, extremely voracious, and pounces with avidity on all kinds of baits. Its flesh, very delicate, was a viand in great estimation as far back as the time of Pliny, who informs us that the inhabitants of Cadiz preferred it to all other fishes. Before the time of Pliny, Columella, who was a native of that city, has mentioned that the name of *zeus* had for a long time been given to this animal, which would seem to indicate a high degree of pre-eminence, Ζευς signifying in Greek the monarch of the gods.

KURTUS is a genus established by Bloch, and so named from the Greek word κυρτος, *hump-backed.* The type is the species *Kurtus Indicus.* This fish, which exhibits very marked relations with stromateus, lives in the Indian Seas, where it feeds on crabs and testaceous mollusca. Its exterior is magnificent. Its scales resemble plates of silver. The iris of the eye is of a golden hue; the back is ornamented with golden spots; four black spots are situated near the dorsal fin. The pectoral fins reflect the colour of gold, and are edged with red. The other fins are of yellow edged with black.

The word CORYPHÆNA is derived from the Greek κορυφη (vertex, the top of the head) the manner in which the vertex is raised into a crest in these fishes being one of their most remarkable characters.

The *Coryphæna hippurus*, is a magnificent fish, which lives in almost all the seas of warm and even of temperate climates. It loses its colours with life. It is found in the Great Equatorial Ocean, so improperly termed the *Pacific* Ocean, in the Atlantic and in the Mediterranean. As it is very common in South America, the French have sometimes called it the Dorade d'Amerique, but it must be carefully distinguished from those other fish called *Daurades*, which we have already had occasion to notice.

The Coryphæna, or dorado, which the ancients, according to the report of Athenæus, consecrated to Venus, is very voracious. It pursues incessantly, the exoceti and flying fish, forces them to shoot out of the water, and receives them, as it were, in its throat the moment they fall back after their short passage in the air. It is sometimes observed even to quit its native element, and raise itself entirely out of the water, to possess itself of a prey which is on the point of escaping.

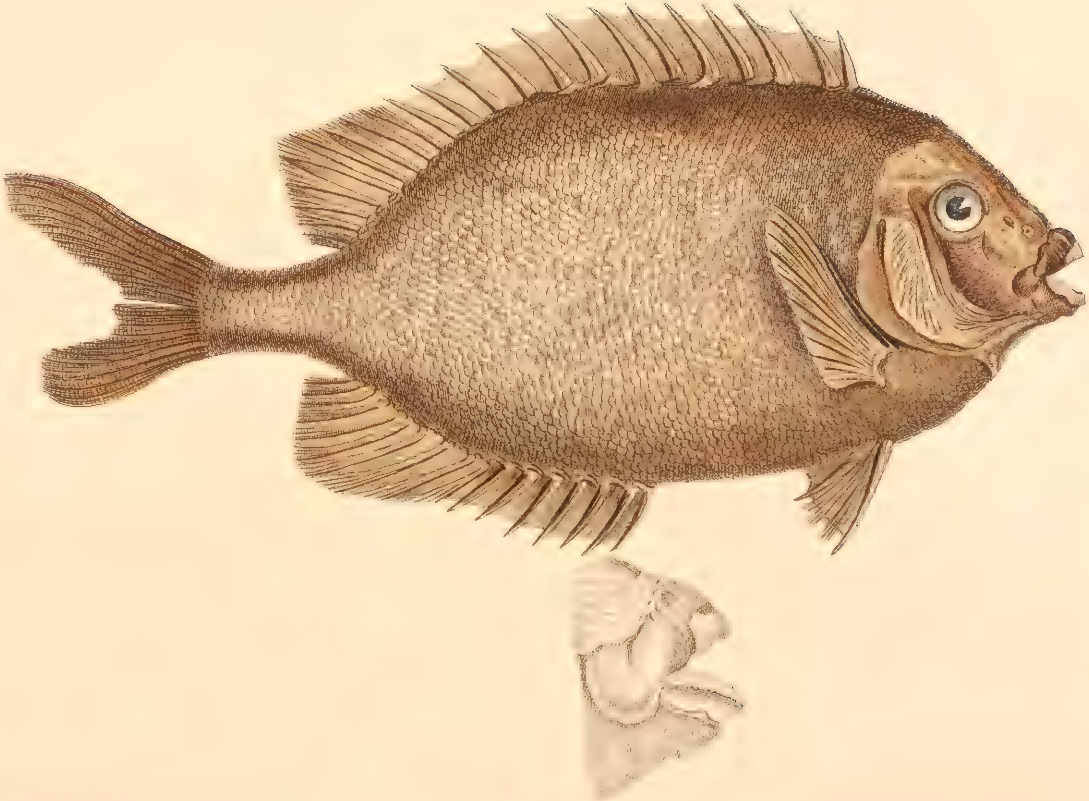
Fishes of this species, which are not very precise in their choice of food, are also frequently seen swimming in large troops around vessels to seize upon every thing which falls into the sea. One has been seen, whose stomach contained iron nails, one of which was five inches and a half in length.

The best bait which can be used to take the coryphæna is the flying fish, and it is often sufficient to represent it rudely with a piece of wood or cork, to which white feathers are attached in the form of wings. During the spawning time in spring and autumn, these fishes are taken with nets near the shore, towards which they proceed to deposit or to fecundate their eggs. In the other seasons, when they prefer the open sea, long lines are employed.

Their growth is very rapid, and they are observed promptly to increase to a large size in the ponds in which they are shut up, when they are taken alive. Their flesh is firm and of an agreeable flavour.

For the table, those of the Mediterranean are more in request than those of the Ocean, and those which live in the sea, than those which enter into salt marshes. They are commonly eaten at Languedoc during Lent, and the best are those of Cette.

Pliny counsels those who have been poisoned by honey of a bad quality to eat of this fish.



Siganus fuscus

The *coryphæna aurata* (*equisetis*, L.) in agility, voracity, and habits, resembles the last. It is found in a great number of warm and temperate seas. It swims with extreme rapidity, and as it were by bounds. The flesh, though dry, is of an agreeable flavour.

The *coryphæna chrysurus* belongs to the South and Indian Seas. It is a very handsome fish, and was observed in 1768, in the Great Equatorial Ocean by Commerson, who then accompanied Bougainville. This naturalist relates that the stomach of an individual which he opened contained abundance of small fish. When the sailors had taken one they attached it to a cord, and drew it along as if it had been swimming on the surface of the sea. By this means they assembled a great number of other fishes of the same species, and could easily pierce them with a harpoon.

Of the tribe of THEUTYES, the SIGANUS, or AMPHACANTHUS, has been named by M. Cuvier, from an Arab word sidjan, inhabits the Red Sea, where it appears to live on zosteræ and marine plants. Its flesh is of an agreeable flavour. The wounds inflicted by the spines of its fins are dangerous. The Arabs think, that used externally, its fat possesses the property of assuaging the pains of the gout.

We insert a figure of a siganus in the British Museum, which is of a uniform olive brown colour.

ACANTHURUS is a genus established by Bloch, and afterwards adopted by Lacépède. The word derived from the Greek indicates the prickles which these fishes have on the side of the tail. The *Acanthurus chirurgus* inhabits the sea of the Antilles, where it is greatly in request in consequence of its fine flavour. It has received the name of surgeon, for the reason mentioned in the text.

The genus NASEUS was first established by Commerson, and has since been adopted by the majority of ichthyologists.

It has very considerable relations with the acanthuri and the chætodons.

We now arrive at the family of the LABYRINTHIFORM PHARYNGEALS, which is remarkable for a structure peculiar to itself, consisting of a division into leaves of the surface of a part of the upper pharyngeal bones, a division which produces cavities and small lodges more or less complicated, but fit for retaining a certain quantity of water, pretty nearly like the net-work of the paunch of the camel. This apparatus is shut up under gibbous opercula, shutting closely against the body, so that even after the fish has come out from the water, that which is contained in these little lodges does not so easily evaporate, but flowing over the gills hinders them from drying up. Accordingly all the fishes of this family, whose habits have been authenticated, possess the faculty of coming out of the rivers and ponds, which are their ordinary sojourn, and of proceeding to tolerably great distances by creeping along in the grass or on the ground.

It is most astonishing that beings which have been scarcely remarked by the naturalists of our days were perfectly well known to the ancients. Theophrastus, in his treatise on fish that can exist on dry land, tells us that there are certain small fishes in India, which come forth from the rivers for some time, and then return, and that these fish resemble those which the Greeks call *μυξινος*, that is the mugiles. It is impossible to designate more clearly some of their subgenera.

The first is a small genus called ANABAS by M. Cuvier, from the Greek word *αναβαινω* (to ascend).

These fishes, so very remarkable from their organization, have gained a peculiar celebrity from a habit, which two Danish observers, both resident at Tranquebar, have witnessed in the species which is common in that district. This is a habit of climbing on the trees, and of living in the water which is accumulated between their leaves. M. de Daldorf, a lieutenant in the service of the Danish East India Company, in an Article in the Linnæan Transactions, 1797, affirms, that he took one of those fishes with his own hands in November, 1791, in the cleft of the bark of a palm-tree, of the species *borassus flabelliformis*, which was growing near a pond. The fish was five feet above the water, and was endeavouring to ascend still higher. For this purpose it fastened itself to the bark by the spines of its opercula, bent its tail, hooked itself by the spines of its anal, then raised and fixed itself afresh, to recommence the same movement. It is by similar movements that this fish walks upon the ground. M. John tells a similar story. This fish, he says, usually remains in the muddy bottom of ponds and lakes. It creeps on dry ground for several hours by the inflexion of its body; and by the assistance of its serrated opercula, and the spines of its fins climbs on the palm-trees which are in the neighbourhood of the ponds, along which the water drops, which the rains have accumulated at their tops.

Nevertheless some observers, not less respectable, have made no mention of the very extraordinary fact: M. Reinwardt, who has frequently taken the anabas at Java, never heard that any thing similar was attributed to it; M. Leschenault, who sent several of these fish from Pondicherry, confines himself to observing that they inhabit rivers and fresh water ponds; Mr. Hamilton Buchanan, in his history of the fishes of the Ganges, goes farther, and perhaps too far; he not only denies the fact, but regards it as contrary to the whole order of nature, and supposes that the observation of Daldorf, with whose testimony alone he was acquainted, was owing to some accidental circumstance, with the cause of which that naturalist was unacquainted.

A point, however, upon which all observers agree, and which is explained by the peculiar conformation of the pharyngeals of this fish, is, that it is one of those which can live out of the water for the longest time; it creeps upon the earth for whole hours together: the fishermen keep it for five or six days in a dry vessel. It is thus brought alive to the markets of Calcutta, from the great marshes of the district of Yazor, which are distant more than a hundred and fifty miles. As individuals are sometimes to be met with at tolerably great distances from the waters, the people believe them to have fallen from heaven; and they hold the same opinion, and for the same reason, of some other fishes, which possess the same property as the anabas, and which derive it from the same structure, particularly the ophicephali. The mountebanks and jugglers, with which India abounds, have generally some of these fishes along with them in vessels, to amuse the populace with their movements.

On the habits of POLYACANTHUS, MACROPODUS, and HELOSTOMA we possess very little information; but, from similarity of conformation, we may conjecture that they are the same as anabas, and that they are likewise inhabitants of the fresh water. This conjecture is strengthened by what Mr. Buchanan informs us respecting several fishes of Bengal, which are evidently of the same family, and similarly conformed. These fishes all inhabit the ponds, marshes, and dykes of the country which is watered by the Ganges, and without being very numerous in any particular part, they are found almost every where. Although agreeable to the taste, their smallness prevents them from being an important article of food. It seems by no means doubtful that they can live on dry land, like all the other fish which have a similar apparatus to the gills.

In Bengal all these fish are comprehended under the name of COLISA, which, however, is more particularly the name of the most common species. M. Cuvier uses it to designate a genus in his great work.

The most celebrated of the fishes which approximate to the preceding is the *gourami*, or OSPHROMENUS of Commerson. That naturalist gave it this name, from the Greek word *οσφρομαι, olfacio,* supposing that its labyrinthiform apparatus was an organ of smell. There is nothing, however, to confirm this conjecture; and it is much more natural to believe that it is a supplementary organ of respiration, or rather a reservoir of water for the respiration of these fish, when the external water fails them.

The *gourami* is not less remarkable for its size than for its excellent flavour. It becomes as large and larger than a turbot, and its flesh is delicious. Commerson tells us that he never ate anything more exquisite in the way of fish, whether of the sea or of the fresh water. He adds, that the Dutch in Batavia rear these fishes in large earthen vessels, renewing the water every day, and feeding them on nothing but fresh water plants, and particularly the *pistia natans.* Even in those which live at liberty, the stomach and long intestines folded a great number of times, never, according to Commerson, contain any thing but plants bruised and crowded into masses.

Other authors, as M. Dupetit-Thouars, speak of them as frequenting the openings of sewers, and devouring greedily their contents.

Commerson believes that this species was brought from China to the Isle of France. They were at first reared in depots by the inhabitants of that island, from which they escaped into the rivers, and are now among the number of fish which live there at liberty. They are considered as a delicacy on the best tables.

We are told that the female of the gourami hollows a little foss in the edge of the hard reservoir in which she is kept, for the purpose of depositing her eggs in it; a sort of solicitude not observed in most fishes.

Of the habits of TRICHOPUS and SPIROBRANCHUS we are ignorant.

If it were possible to admit that anomalous beings existed in nature, there would be none that might more justly be considered as such than the OPHICEPHALI; not so much in consequence of their scaly head, like that of serpents, from which their name is derived, but from the total absence of spines to the fins, except the single spine of the ventral, while in all other points they exhibit a singular analogy with the preceding genera; but in this they seem to break the grand division of osseous fishes into acanthopterygii and malacopterygii, which, up to this genus, had appeared to interfere with no natural relation.

Theophrastus was acquainted with these singular fish, for it is to them that we must refer the passage already quoted from that philosopher; but the moderns appear to have known nothing of them until rather lately.

The cavity for retaining a reserve of water, with which the ophicephali are provided, gives them, like the anabas, the faculty of living for a long time on dry land. They proceed from the marshes, &c., which they inhabit, to considerable distances in search of others. They are so tenacious of life that their bowels may be torn out, and they may be cut in pieces without being killed at once, and they are often thus sold alive, by slices, in the market, nor do they sell at so high a price when so much of them is cut off that the rest ceases to move.

The flesh of the ophicephali, without having much flavour, is light, and easy of digestion; nevertheless it is eaten only by the Indians. It is not served on the tables of Europeans, perhaps in consequence of the resemblance of those fish to reptiles.

The *Ophicephalus marginatus*, called in India *gachua*, we are told by Mr. Buchanan, sometimes grows to a foot in length, though it seldom exceeds a span. It is very common in the ponds and dykes of Bengal, and is one of the species respecting which the people most universally entertain the notion that it falls with the rain. In fact, from the first heavy rains of the bad season, these fishes are to be seen creeping about in the grass; but the naturalist just mentioned thinks that this habit is merely owing to their being tired of the muddy and corrupted water to which they are reduced at the end of the dry season in the narrow dykes which they inhabit, and that they are attracted by the first rains which moisten the neighbouring grass to quit these miserable receptacles in search of purer water, ampler space, and fresher nourishment.

There are several other species of ophicephali, but we can add nothing of interest respecting their habits, except in the case of one called *barca*, which always remains in holes excavated in the vertical banks of the Bramapootra, and only puts forth its head for the purpose of watching its prey. It is a disagreeable animal to look at, says Mr. Buchanan, notwithstanding the vivacity of its colours; but it is considered as most excellent eating. Some are three feet in length.

Of the family MUGILOIDES, the genus MUGIL is supposed to derive its name from the contraction of two Latin words, signifying *very agile (Multum agilis)*.

The *Mugil cephalus* (common mullet) weighs about ten or twelve pounds, and inhabits almost all seas, but particularly the Mediterranean and towards the southern shores of the ocean; for it is scarcely ever to be met with in the channel. It is very common along the coast of Spain, and especially round the Isle of Iviça, where the fishermen recognize two varieties of it, under the names of mugil and lissa.

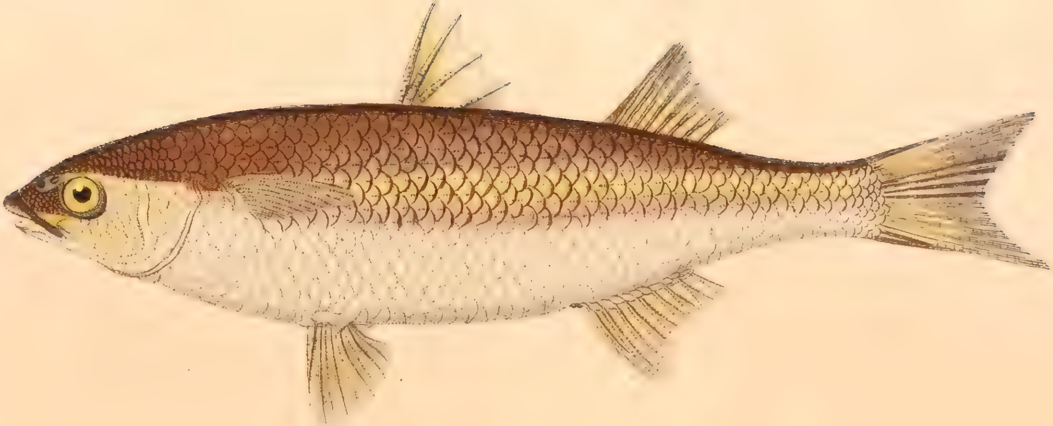
Its hearing is very fine, as has been noticed by Aristotle, and it feeds on worms and small marine animals; but it is doubtful, though it has been advanced, that it can live on vegetable substances. It appears to be of a stupid character, a fact which was known in the time of Pliny, for that author tells us that there is something ludicrous in the disposition of the mullets, for if they are afraid they conceal their heads, and thus imagine that they are entirely withdrawn from the observation of their enemies.

When towards the end of spring and the commencement of summer the fishes of this species, excited by the necessity of living in the fresh water, approach the shores and advance towards the mouths of rivers, they form such numerous troops that the water through which they are seen, without being clearly distinguished, appears to be bluish: this particularly happens in the Garonne and the Loire at these periods.

The fishermen there adopt the plan of surrounding these legions of mullets with nets, the inclosure of which they gradually contract, taking care to make a noise to frighten the fish, and oblige them to press together, and heap themselves as it were one upon the other.

Of the mullets thus taken some are eaten fresh, others are salted and smoke-dried; it is with their eggs salted, washed, pressed, and dried, that the preparation called *botarcha* is made, which is a condiment greatly in request in Italy and the southern provinces of France.

The flesh of this mullet is tender, delicate, and of an agreeable flavour; it is fatter and more in estimation when it is taken in the fresh water. The ancients, who from the time of Aristotle were acquainted with this fish, had it in great request, and the consumption of it is still very considerable in most of the southern countries of Europe. According to the report of Athenæus, those mullets were formerly in very high esteem which were taken in the neighbourhood of Sinope and Abdera, while, as Paulus Jovius informs us, those were very little prized which had lived in the salt marsh of Orbitello, in Tuscany, in the Lagunes of Ferrara and Venice, in those of Padua and Chiozza, and such as came from the neighbourhood of Commachio and Ravenna.



Mugil menhecla – Bennett

[illegible]

All these places in fact are marshy, and the streams by which they are watered are brackish, and communicate to the fish which they support the odour and the flavour of the mud.

The *Mugil saliens* is so called from its faculty of leaping with most extraordinary velocity when it finds itself enclosed in a net. It scarcely weighs a pound.

The *mountain mullet* of Dr. Bancroft, of which, by the kindness of that gentleman, we insert a figure, was observed and drawn by him in Jamaica.

The *Mugil albula* belongs to North America, and especially to the sea which bathes the shores of Carolina. It ascends into the rivers at each flood tide, during the whole summer. These fish are often abundant enough, according to M. Bosc, to cover the whole surface of the water. The flesh is equally good with that of the common mullet.

In the family of GOBIOIDES, the genus BLENNIUS was so named by the Greeks in consequence of the abundant mucosity with which these fishes are invested. They do not afford any great interest to navigators, for they are too small, and not sufficiently numerous to be useful to sailors in the way of food. But naturalists search after them with eagerness, in consequence of their habits, or of divers attributes which render them worthy of observation. We know that all venomous reptiles, and others which are not venomous, such as the *coluber heterodon*, the anguis proper, and the land salamander, are ovoviviparous, that is, that the eggs disclose the young in the interior of the body, and the latter come forth alive and completely formed. This singular property, which seems to unite by an intermediate chain the oviparous to the viviparous animals, is also found in many fish belonging to very different genera, such as the squali and the blennius. One species, the *Blennius saliens*, approximates to the flying fish in the length of the pectoral fins, which assist it in shooting forth and gliding swiftly over the surface of the waters, and in escaping from the tops of the rocks, where it is sometimes found dry, and from whence it darts by numerous and rapid leaps into the middle of the waves. The blennii all live in the sea, near rocks, into the deepest clefts of which they sometimes retire; accordingly, in the time of Pliny, it has been believed that they could pierce stones, and (by a rational deduction) that they consequently presented a salutary and lithontriptic nutriment to persons afflicted with the stone.

The fishes of the genius GOBIUS have been supposed by Belon and Rondelet to be the same as those so called by the ancients; a fact, however, which may be considered doubtful.

These fishes usually remain upon the sand; they even frequently conceal themselves in it altogether. Most of the species have recourse to stratagem to procure their food; their glutinous body is covered with mud, and thus masked they approach slowly to the little animals which are to become their prey.

It is also asserted that the sort of funnel produced by the union of their catopes, performs with these animals the office of a cupper or sucker, by the aid of which they keep themselves fixed upon the solid bodies which they meet with at the bottom of the waters.

The *Gobius niger*, Lin., or *boulereau*, Lacép., is usually about six or seven inches long: it frequents all the seas of Europe, where it feeds on small fish and marine worms. It is common in the North Atlantic, where it comes to spawn in spring on the coasts and at the mouths of great rivers; it equally inhabits many Asiatic seas, and is very much extended in the Grecian Archipelago. It is easily taken with the line.

The flesh of this fish has considerable analogy in taste with that of the perch. At the present day it forms a general article of food, but (if it be the same) Juvenal informs us that under the first emperors of Rome, and in the time of the greatest luxury in that capital of the world, it seldom appeared on the tables of the rich and sumptuous.

> Nec mullum cupias, cum sit tibi gobio tantum
> In loculis.

Which Martial seems to confirm when he says, in the thirteenth book of his Epigrams,

> In Venetis sint lauta licet convivia terris,
> Principium cœnæ gobius esse solet.

This fish seems to have been known by Aristotle and Athenæus: both writers appear to speak of it under the name of *τραγος*, (*the goat,*) from a sort of fancied resemblance in its black and united catopes to the beard of that quadruped. Paul, of Egina, considered the flesh of this animal as a laxative, and used to make pills of it.

The habit attributed to *Lophius piscatorius,* sometimes called the fishing frog, of deceiving its prey by means of the worm-like filaments attached to the head, which is mentioned in the text, would, if satisfactorily established, carry the intellectual faculties of this species beyond those of most of its class.

The CHIRONECTES are in the division of PECTORALES PEDICULATI. These fishes, from the peculiar conformation of their pectoral fins, can creep on land almost like little quadrupeds. The pectorals, by reason of their position, perform the office of hinder feet. They can live out of the water for two or three days. They inhabit the seas of warm climates. The word *chironectes* is Greek, and indicates the peculiar faculty which the species possess, (*χειρ*, *a hand*, and *νεω*, *to swim.*)

The *Chironectes histrio* derives its epithet from the prompt and rapid movements which it gives to its fins and filaments, and which have been compared to scenic gesticulation. Probably it may have also been thus named because it can rapidly swell out its abdomen, and changes its figure as it were at will.

The histrio comes to the length of about nine or ten inches. It is met with in the seas of Brazil and China; in Ceylon, according to Thunberg, it is seldom larger than one's finger. Formerly it was attempted to transport some living individuals to Holland, where they sold as high as twelve ducats a-piece. It conceals itself in marine plants and between stones, to watch and surprise its prey, and it feeds more especially on small crustacea. Its flesh is not eatable.

The genus LABRUS, very numerous in species, forms the type of the family LABROIDES. In the Linnæan system it was the receptacle of a crowd of ill-determined species, and even in its present restricted form it contains a multitude of fishes disseminated over the whole globe, to the north, and the south, in sea, in lakes, and in rivers; near the burning shores of Surinam or of the East Indies, and in the neighbourhood of the islands of ice accumulated on the coasts of Norway or of Greenland; not far from Carolina; and in the waters which bathe the shores of China and Japan, and also on the coasts of Scotland.

“ Nature,” says Count Lacépède, “ has granted to the labri neither size, nor strength, nor power, but they have received as their share of her favours, agreeable properties, agile movements, rapid oars, and they are adorned with all the colours of the rainbow. The most varied shades and the most lively hues have been lavished on them; sometimes dispersed, sometimes united in troops more or less numerous, these elegant and brilliant fishes feed on mollusca and crustacea, and appear to prefer the neighbourhood of rocks not subjected to the dashing of the waves.

Their flesh in general is of an agreeable flavour; but they do not appear to be in any very extraordinary demand.

We have nothing to add on the numerous species of labrus, nor on the subsequent subgenera.

Of CHROMIS, the species *vulgaris* is taken in thousands in the Mediterranean Sea. The fishers on the coast of Genoa call it *Castagno,* in consequence of its chestnut colour. Its flesh is in no estimation. The *nilotica* is found in the Nile, in the small canals which are derived from that river, and in the pools of water which remain after the inundation. It feeds on aquatic plants and worms. Its flesh is delicate, and of an agreeable flavour, and it is considered as the best fish in the Nile.

Of SCARUS, the *creticus*, erroneously referred by Lacépède and others, to the genus *Cheilinus*, which is of the Eastern Seas, inhabits the Mediterranean, and particularly appears near the coasts of Sicily and Greece. Accordingly it was known by the first Greek naturalists. Aristotle, Athenæus, Elian, and Oppian, speak of it under the name of *σκαρος*.

In the first centuries of the Christian era it used to advance into the Carpathian Sea. Its celebrity was very great among the ancients, who neglected no means of procuring it.

In the reign of Claudius, Optatus Elipertius, commandant of a Roman fleet, brought many of these fishes alive, which he spread along the coast of Campania, where they multiplied very quickly, because for five years any of them which happened to be taken by the fishermen in their nets, were immediately thrown back into the sea.

In the time of the greatest luxury of the Romans, the scarus constituted a delicacy on the most sumptuous tables. It entered into the composition of those famous viands, in which the rarest objects were united, and which were served up to Vitellius in the dish named the shield of Minerva.

The entrails of this fish, according to the report of Rondelet, have an odour of violets. This was the part more especially in request among the ancients, and which, as Athenæus informs us, they considered a *divine* viand.

> Hic scarus, æquoreis qui venit obesus ab undis,
> Visceribus bonus est, cætera vile sapit.
>
> Mart. Ep. 84. Lib. XIII.

This scarus lives in numerous troops in the holes of the rocks which border the shores of the islands of the Archipelago. It does not come out readily, and the Greek fishermen assert that at the head of each troop there is constantly a chief. It is taken only by the line. When one of these fishes has bitten at the hook, it is attached to a thread and left in the water. Its companions abandon their dark retreats to surround it, and are finally taken themselves.

It has been long remarked that this scarus, unlike most other fishes, was not carnivorous, but fed upon the fuci and algæ, which grow on the rocks at the bottom of the sea. It also seeks after ordinary vegetables, and the leaves of peas and beans may be employed with success as a bait in fishing for it.

Many naturalists have accorded to it the faculty of ruminating, which is an error. Others assure us that it possesses a voice, another mistake. It is possible that it may make some noise by its movements.

The Centriscus (scolopax) is an inhabitant of the Mediterranean, and sometimes to be seen in the markets of Rome and other towns of Italy. Its general colour is a soft and agreeable red. The considerable elongation of its muzzle and its tubular form have caused it to be compared to a number of different objects, sometimes to a woodcock, sometimes to an elephant, sometimes to a bellows, &c. Thus at Rome it is named *soffieta*, at Genoa *trombetta*, and with us *trumpet-fish*. Its flesh is delicate and esteemed.

The second division of common fishes, or that of the MALACOPTERYGII, contains three orders, characterized by the position of the ventrals or by their absence. We proceed to the Barai's arrangement of them.

THE

SECOND ORDER OF FISHES.

MALACOPTERYGII ABDOMINALES.

By this we mean those fishes whose ventrals are suspended to the under part of the abdomen, and behind the pectorals, without being attached to the humeral bone. This is the most numerous of the three orders, and comprehends the greater part of the fresh-water fish.

We subdivide them into five families.

The first family, or that of

Cyprinoides,

Is recognized by a mouth but slightly cleft, weak jaws, most frequently without teeth, and the edge of which is formed by the intermaxillaries; by pharyngeals strongly dentated, which compensate for the slight armature of the jaws; and by branchial rays not very numerous. Their body is scaly; they have no adipose dorsal, such as we see in the siluri and salmons: their stomach has no cul-de-sac, nor their pylorus any cœcal appendages. They are the least carnivorous of all fishes.

CYPRINUS.

Forms a genus very numerous and very natural, easily to be distinguished by the small mouth, the jaws without any teeth, and the three flat rays of the branchiæ. Their tongue is smooth; their palate is furnished with a thick, soft, and singularly irritable substance, which is vulgarly known under the name of *carp's tongue ;* their pharynx presents a powerful instrument of mastication, which consists in some large teeth adherent to the inferior pharyngeal bones, and capable of pressing the aliments between them, and a stony disk enchased in a wide cavity, under an apophysis of the basilary bone. These fishes have but a single dorsal, and their body is covered with scales, most frequently very large. They inhabit the fresh waters, and are perhaps the least carnassial of the entire class, living for the most part on grass, grains, and even mud. Their stomach is continuous with a short intestine, devoid of cœca, and their bladder is divided in two by a strangulation.

We subdivide them into subgenera as follows:

CYPRINUS, properly so called, *Cuv.*

With a long dorsal, which, as well as the anal, has a spine more or less strong, as a second ray.

Some have barbels to the angles of the upper jaw.

Such is

Cyprinus carpio, (the common carp,) L. Bloch. 16. A fish universally known; green inclining to olive, yellowish underneath, with the dorsal and anal spines strong and denticulated, and the barbels short; its pharyngeal teeth are flat, and striated at the crown. Originally from the central part of Europe, it lives in our calm waters, where it attains as much as four feet in length. It is easily reared in vivaries and ponds, and its flesh is generally of an excellent flavour.

Monstrous individuals of this species are pretty frequently observed, with a forehead extremely gibbous and a very short muzzle.

A race with large scales is sometimes reared, certain individuals of which have the skin naked at intervals, or even altogether so, and which is named *Queen of the carps,* &c. (*Cyprinus rex cyprinorum,* Bl. 17.[1])

Other species are destitute of barbels. Such are, in Europe,

Cyprinus carassius, L. Bl. xi. Body very much elevated, lateral line straight, head small, and caudal cut squarely.

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[1] The *Cyprinus, Anne-Caroline,* Lacép. V. xviii. 1. *rouge-brun,* Id. ib. xvi. 1., *mordoré,* ib. 2., *vert-violet,* ib. 3., all known only from Chinese paintings, approach very much to the carp. The Chinese, who are fond of rearing fresh-water fish, succeed in obtaining very different varieties, the figures of which are to be seen in their collections; but it would not be very safe to establish species on documents like these alone.

It is rare in our environs, but very common in the north.

C. gibelio, Gm. Bl. 12. Body somewhat less elevated, lateral line arched towards the bottom, and the caudal crescent-shaped.

It is more common around Paris. The spines of these two species are weak, and it is difficult to perceive any denticulation.

Such, again, is a species imported among us, and very much multiplied in consequence of the brilliance and variety of its colours: it constitutes a chief ornament of our reservoirs.

Cyp. auratus (Golden carp. Gold fish.) L. Bloch. 93. The dorsal and anal spines are denticulated, as in the common carp; blackish at first, it assumes by degrees the fine golden red by which it is characterized; but some are found of a silvery hue, and others variegated with these three shades of colour. There are also some individuals without a dorsal, others with a very small one, others whose caudal is very large, and divided into three or four lobes, and others whose eyes are enormously enlarged; all these accidents, the result of domestic education, may be combined in various modes and degrees[1].

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[1] Such are the *Cypr. macrophthalmus*, Bloch 410., or the *gros yeux*, Lacép. V. xviii. 2., the *C. quatre lobes*, Lacép. ib. 3., and the varieties of the *auratus*, Bl. 93, 94, &c. See the "Collection de Dorades de la Chine," by Sauvigny and Martinet. Add *Cypr. devarid*, Buchanan, pl. vi. f. 94. *C. catla*, Id. pl. xiii. f. 81.

To this group also belongs the smallest of our European cyprini, called

Cypr. amarus, Bl. viii. 3. An inch long; greenish above, a fine aurora-colour underneath; in April, during the spawning time, it has a steel-blue line on each side of the tail; the second dorsal ray forms a tolerably stiff spine.

BARBUS, *Cuv.*

The dorsal and anal are short; there is a strong spine for the second or third ray of the dorsal, and four barbels, two on the end, and two at the angles of the upper jaw.

Cyprinus barbus, L. Bloch. 18. To be recognized by its oblong head: it is very common in clear and running streams, where it sometimes attains the length of more than ten feet.

Italy possesses some kindred species, whose spine is weaker, but which, nevertheless, differ from *gobio* in having four barbles. (*Barbus caninus*, Bonnelli; *B. plebeius*, Val.; *B. eques*, Id. [1])

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[1] Add the barbels of the Caspian sea, *Cyprinus mursa*, Guldenstedt, Nov. Comm. Petrop. XVII. pl. xviii. f. 3—5. *C. bulatmai*, Pall, and the barbels of the Nile (*Cypr. binny*, Forsk. 71.); Sonnini, Voy. pl. xxvii. f. 3., or *Cypr. lepidotus*, Geoff. Eg. Poiss. du Nil. pl. x. f. 2.

N.B. Bruce, after giving the history of the true binny, refers to it by mistake the figure and description of a *polynemus*, which he had designed in the Red Sea, from which has originated the imaginary species of the *Polyn. Niloticus*, Shaw.

Gobio, *Cuv.*,

Have the dorsal and anal short, without spines to either, and some barbels.

We have a species with the fins picked out with brown, which, notwithstanding its smallness, is esteemed for its excellent flavour, *Cypr. gobio*, L. Bl. 8. f. 2. It lives in companies in our fresh waters, and seldom exceeds eight inches in length[1].

Tinca, *Cuv.*

Unite to the characters of gobio that of having but very small scales; their barbels are also very small.

We have one, *Cypr. tinca*, L. Bl. 14. (the common tench), short and thick, of a yellowish brown, which is good only in certain waters, and which sometimes assumes a fine golden colour. (*Cypr. tinca auratus*, Bl. 25.) It prefers stagnant waters for its habitation.

Cirrhinus, *Cuv.*

Have the dorsal larger than gobio, and their barbles on the middle of the upper lip[2].

There are also barbi in India, such as *Cypr. calbasu*, Buch., Fishes of the Ganges, pl. xi. f. 33.; *C. cocsa*, Id. pl. iii. f. 77.; *C. Daniconius*, Id. xv. 89.; *C. kunama*, Russel 204.; *C. morula*, Buch. xviii. 91.; *C. gonius*, ib. iv. 82.; *C. Rohita*, ib. xxxvi. 85.; and many others which we shall describe in our Ichthyology. We even have some from America.

[1] Add *Cypr. capoeta*, Guldenst. Nov. Comm. Petrop. xvii. pl. xviii. f. 12.; *C. curmuca*, Buchan. Voy. to the Mysore, iii. pl. xxx.; *C. bendelesis*, Id. ib. pl. xxxii.

[2] *Cypr. cirrhosus*, Bl. 411. *C. mrigala*, Buch. pl. vi. f. 79. *C. nandina*, Id. viii. 84.?

ABRAMIS, *Cuv.*

Have neither spines nor barbels; their dorsal is short, placed behind the ventrals, and their anal is long. We have two species.

C. brama, L. Bl. 13. (the common bream). The largest species of this subdivision; there are twenty-nine rays to the anal, and all the fins are obscure. It is a tolerably good fish, found in great abundance, and easily multiplied.

C. blicca, C. latus, Gm. Bl. 10. (little bream). Pectorals and ventrals reddish; twenty-four rays to the anal; not much esteemed, and but little used except for feeding fish in fish-ponds[1].

LABEO, *Cuv.*

The dorsal is long, like that of the carps, properly so called, but the spines and barbels are wanting, and the fleshy and frequently crenated lips, are remarkably thick. The species are all foreign[2].

CATASTOMUS, *Lesueur.*

The same thick, pendant, and fringed or crenated lips as labeo; but their dorsal is short, like that of *Leu-*

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[1] Add three fishes which ascend from the Baltic into the rivers which disembogue themselves into that sea, *C. ballerus*, Bl. 9.; *C. vimba*, L. Bl. 4.; and *C. Buggenhagii*, Bl. 95.; and, in foreign species, *C. cotis*, Buchan. pl. xxxix. f. 93.

[2] *C. Niloticus*, Geoffr. Poiss. du Nil, pl. ix. f. 2. *C. fimbriatus*, Bl. 409., to which must be added the *Catostomus cyprinus*, Lesueur.

ciscus. It is parallel above, with the ventrals. They live in the fresh waters of North America[1].

LEUCISCUS, *Klein.*

The dorsal and anal are short, and without spines and barbels; there is nothing particular in the lips. This subdivision is numerous in species, but their flesh is in little estimation. The names of *Meunier, Chevanne, Gardon,* &c. are indiscriminately applied to them in our various provinces[2].

We distinguish them according to the position of their dorsal, a character which is not always sufficiently defined. In some it corresponds above with the ventrals below, or is parallel with them.

Of this group we possess,

Cyprinus dobula, L. Bl. 5. (*le meunier.*) Head broad; muzzle round; pectorals and ventrals red.

C. idus, Bl. 6., and better, Meidinger 36. (*le Gardon.*) Of nearly the same colours, with the head less broad, the back more elevated, and the muzzle more convex.

Cyprinus rutilus, L. Bl. 2. (the roach.) Body compressed and silvery; all the fins red.

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[1] M. Lesueur has described seventeen species in the Journal of the Academy of the Natural Sciences, Philadelphia, tom. i. 1817, p. 88. &c., and figured nine; but the first must be struck out, *Cat. cyprinus,* which is rather a labeo. Add *Cypr. teres,* Mitchill, Trans. New York, I. vi. ii., and the *Cyprin sucet,* Lacép. V. xv. 2.

[2] N.B. Bloch and his successors have not followed the usage of the environs of Paris in the application of these French names, which they have bestowed almost at hazard.

C. leuciscus, Bl. 97. fig. 1. Body narrow, fins pale, muzzle a little prominent.

In the Rhine is taken,

C. nasus, L., whose muzzle is more salient than that of the last, and more obtuse [1].

In others the dorsal corresponds above to the interval which is between the ventrals and the anal.

Of this group in our waters there are,

C. Erythrophthalmus, Bl. 1. Red fins, like the rutilus; the body higher and thicker.

C. alburnus, L. Bl. 8. f. 4. (the bleak.) Body narrow, silvery, and brilliant; fins pale; forehead straight, and lower jaw a little longer: very abundant throughout the whole of Europe. This is one of the fishes whose nacre is employed in the fabrication of false pearls.

Cyp. bipunctatus, L. Bl. 8. f. 1. (smelt of the Seine.) Very similar to alburnus; two black points on each of the scales of its lateral line.

Cyp. phoxinus, L. Bl. 8. f. 5. Spotted with black: the smallest species of this country.

The rivers of Germany and Holland nourish *C. orphus,* Bl. 95., of a fine minium red [2].

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[1] Add *Cypr. grislagine, C. jeses,* and in foreign species *Cypr. pala,* Cuv., Russ. 207.; *C. tolo,* Cuv., Russ. 208.; *C. boga,* Buch. Fish of the Gang. pl. xxviii. f. 80.; *C. mola,* ib. xix. f. 86.; *C. sophore,* ib. xxxviii. f. 92.; *C. ariza,* Id. Voy. to the Mysore, III. xxxi. The difficulty of recognizing the figures given by authors of species so similar, is still increased by there being in the rivers of Europe many other species yet unrepresented.

[2] Add *C. aspius,* Bl.: in foreign species, *Cypr. basbora,* Buch.

There are some, in fine, in which the dorsal corresponds to the commencement of the anal (the CHELA of Buchanan); and in several of these the body is compressed, almost as in certain of the clupeæ. Such is

Cypr. cultratus, L. Bl. 37. Remarkable for its lower jaw, which ascends in front of the upper, and for its large scythe-like pectorals, &c [1].

This group possesses some species with barbels [2].

We might separate from all the other cyprini,

GONORHYNCUS, *Gron.*

Which have the body and the head elongated and covered, as well as the opercula, and even the membrane of the branchiæ, with small scales; the muzzle prominent, in front of a little mouth, without teeth, and without barbles; three rays to the branchiæ, and a small dorsal just above the ventrals.

But one species is known, from the Cape of Good

Fish of the Gang. II. f. 90.; *C. morar*. ib. xxxi. f. 75., and a great number of others belonging to the fresh waters of all parts of the world, several of which have been already indicated by MM. Buchanan, Mitchill, &c., and to which we shall add some more in our history of fishes. Mr. Buchanan alone has discovered in India more than eighty species of cyprinus: we only cite here those of which he has given figures.

[1] Add *Cypr. clupeoïdes*, Bl. 408. 2,; *C. bacaila*, Buchan. viii. 76.

[2] *Cypr. dantica*, Id. xvi. 88.

Hope, *Cyprinus gonorhyncus,* Gm. Gron. Zooph. pl. x. f. 24[1].

Cobitis[2], *L.*

Have the head small, the body elongated, clothed with small scales, and invested with a mucous substance; the ventrals are very much behind, and above them is a small single dorsal; the mouth is at the end of the muzzle, not much cleft, without teeth, but surrounded by lips adapted for sucking, and by barbels; the gills are not much open, and have only three rays; their inferior pharyngeal bones are pretty strongly dentated; there are no cœca to their intestine, and their small natatory bladder is enclosed in an osseous, bilobate case, adhering to the third and fourth vertebræ[3].

We have three species in our fresh waters,

Cobitis barbatula, L. Bl. 31. 3. A small fish, four or five inches long, shaded and punctated with brown on a yellowish ground, with six barbles: common in our streams, and its flavour is excellent.

Cobitis fossilis, L. Bl. 31. 1. (*Loche d'etang: Pond loache* or *Sucker*) *Misgurn*[4], Lacép. Sometimes a foot in length, with brown and yellow longitudinal rays and ten barbels. It remains in the mud of ponds, where it exists a long time, even when these ponds are frozen or dried up; when the weather is stormy it comes to the surface, agitates it, and troubles the water; when it is cold the fish retires very carefully into the mud. It swallows the air incessantly, which it gives out *per anum*, after having changed it into carbonic acid, as has been well observed by M. Ehrman. Its flesh is soft, and has a flavour of the mud [1].

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[1] Badly copied, Schn. 78.

[2] Κωβῖτις, the Greek name of a small, badly ascertained fish.

[3] See Schneider Syn. Pisc., Arted. p. 5. and 337.

[4] N.B. I do not separate the *misgurns* from *cobitis* or the *loaches,* because their organization differs in nothing, and the first have no teeth in their jaws any more than the others. I have sought to no purpose for those here described by Bloch.

Cobitis tænia, L. 12., Bl. 31. 2. Six barbels; body compressed, of an orange-colour, marked with a series of black spots. It is distinguished from the two former species by a forked and moveable prickle, formed by the suborbital, in front of the eye. It is the smallest of the three. It keeps in rivers, between stones, and is but little in request [2].

ANABLEPS [3], *Bl.*

For a long time, and very erroneously, united to *cobitis*, or the *loaches*. These fishes have very peculiar characters; in the first place, their eyes, very projecting, under a vault formed on each side by the frontal bone, have the cornea and the iris divided into two portions by transverse bands, so that they have two pupils, and appear double, though there is but one crystalline, one vitrea, and one retina[1]; of this there is no other example among vertebrated animals. The organs of generation and the bladder of the male have their excretory canal in the anterior edge of the anal fin, which is thick, long, and clothed with scales; its extremity is pierced, and doubtless serves the purposes of coition. The female is viviparous, and the young are born in a tolerably advanced stage of organization.

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[1] Add the three species of cobitis with unarmed cheeks, described by Buchanan, Fishes of the Ganges, p. 357—359.

[2] Add *Cobitis geta*, Buchanan xi. 96. and the seven other species with armed cheeks described by that Ichthyologist Fishes of the Ganges, p. 350. 356.

[3] From ἀναβλέπω, (to raise the eyes, or look up,) a name given by Artedi.

These fishes have a cylindrical body, clothed with strong scales, five rays to the gills, the head flatted, the muzzle truncated, the mouth cleft transversely at the end, and armed in both jaws with small and crowded teeth; the intermaxillaries without pedicle, and suspended beneath the nasal bones, which form the anterior edge of the snout; the pectorals in a great measure scaly, and a small dorsal placed over the tail, and farther back than the anal. Their pharyngeal bones are large, and furnished with many small globular teeth; their air-bladder is very large, and their intestine ample, but without cœca.

But a single species is known, from the rivers of Guiana, *Cobitis anableps*, L.; *Anableps tetrophtalmus*, Bl. 361.

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[1] See Lacép. Mém de l'Institut. tom. ii. p. 372.

PŒCILIA, *Schn.*

Have the two jaws flatted horizontally, protractile, but little cleft, furnished with a single range of small and very fine teeth; the upper part of the head flat, the opercula large, fine rays to the gills, the body but little elongated, the ventrals not very far back, and the dorsal just above the anal. They are small viviparous fishes of the fresh waters of America[1].

LEBIAS, *Cuv.*

Resemble pœcilia, with the exception that their teeth are denticulated.

There is a species in Sardinia (*Pœcil. calaritana*, Bonnelli). A very small fish marked with little blackish rays upon the flanks[2].

FUNDULUS, *Lacép.*

Have also many relations with pœcilia; but their teeth are small and crowded, and those of the anterior range are bent; they have some conical teeth rather strong at the pharynx: there are but four rays to the gills[3].

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[1] *Pœcilia Schneideri*, Val., or *P. vivipara*, Schn. 86, 2.; *P. multilineata*, Lesueur, Journ. Sc. Philad. Jan. 1821, pl. i.; *P. unimacula*, Val. App. Humb. Obs. Zool. ii. pl. li. 2.; *P. Surinamensis*, Id. ib. p. 1.

[2] Add *Lebias ellipsoidea*, Lesueur, Ac. Sc. Philad. Jan. 1821, pl. ii. f. 1. and 3.; *Leb. rhomboïdalis*, Val. Ap. Humb. Obs. Zool. ii. pl. li. 3.; *Leb. fasciata*, Id. ib. 4.

[3] *Fundulus cœnicolus*, Val., or *Cobitis heteroclita*, Lin., or *Pœcilia*

MOLINESIA, *Lesueur.*

Are distinguished by the position of their anal between the ventrals, and under the origin of the dorsal, which is very large. Their teeth are the same as those of the fundulus, and they have but four or five rays to the branchiæ[1].

CYPRINODON, *Lacép.*

Have fine and crowded teeth, and six rays to the gills: in other respects they resemble the three preceding genera.

There is one species in the lakes of Austria, particularly in the subterranean waters, *Cyp. umbra*, Cuv., UMBRA, Cramer. A small fish, of a reddish brown with some brown spots[2].

The second family of the MALACOPTERYGII ABDOMINALES, or that of

ESOCES.

Is also deficient in the adipose dorsal; its upper jaw

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cænicola, Schn.; *Mud-fish* of Schœpf; *Fund. fasciatus*, Val. loc. cit. liii. 1., or *Pœcilia fasciata*, Schn., or *Esox pisciculus*, Mitch., of which his *Esox zonatus*, or *Hydrargyre swampine*, Lacép. v. 319. is the young, but the figure V. x. 3. is of another species; *Fund. Brasiliensis*, Val. loc. cit. lii. 2.

[1] *Molinesia latipinna*, Lesueur, Ac. Sc. Nat. Philad. Jan. 1821, t. iii. 1.

[2] Add *Cyprinodon flavulus*, Val. loc. cit. lii. 3., which is the *Esox flavulus*, Mitch. pl. iv. f. 8., or the *Cobitis maialis*, Schn.; *C. ovinus*, or *Esox ovinus*, Mitch. ib.; *C. variegatus*, Lacép. V. xv. 1.

has its edge formed by the intermaxillary, or, at least, when this does not form it altogether the maxillary is without teeth, and concealed in the thickness of the lips. These fishes are voracious; their intestine is short, without cœca: several of them re-ascend into the rivers; all have a natatory bladder. Except microstoma, all those with which we are acquainted have the dorsal opposite to the anal.

Linnæus united them in his genus of

Esox, *L.*

Which we divide as follows:

Esox (properly so called), *Cuv.*

Have small intermaxillaries furnished with small pointed teeth at the middle of the upper jaw, of which they form the two-thirds; but the maxillaries which occupy the sides have no teeth. The vomer, the palatines, the tongue, the pharyngeals, and the arches of the branchiæ are bristled with teeth like those of a card; on the sides of the lower jaw is, moreover, a series of long pointed teeth. Their muzzle is oblong, obtuse, broad, and depressed; they have but one dorsal, opposite to the anal. Their stomach, ample and folded, is continued with a slender intestine, and without cœca, which is twice folded. Their natatory bladder is very large.

We have one in Europe, *Esox lucius,* L., Bl. 32., (the common pike), universally known as one of the most voracious of fishes, and one of the most destructive; but its flesh is good, and easy of digestion.

This species is also found in the fresh waters of North America, where there are also two others, one with brownish lines upon the flanks, which sometimes form a net-work, *Esox reticularis*, Lesueur, Ac. Sc. Nat. Philad.; the other sprinkled with round and blackish spots, *Ex. Estor*, Id. ib. i. 413.

GALAXIAS, *Cuv.*

The body without apparent scales, the mouth but little cleft, some pointed and middle-sized teeth in the palatines and both jaws, of which the upper has almost its entire edge formed by the intermaxillary; finally, there are some strong hooked teeth on the tongue.

The sides of their head present pores; and the dorsal corresponds to the anal, as in esox, to whose intestines theirs also bear an exact resemblance [1].

ALEPOCEPHALUS, *Risso.*

Have pretty nearly the same general forms, but their head only is without scales; there are broad scales on the body; their mouth is small, and has only fine and crowded teeth; the eye is very large, and there are eight rays to the gills.

But one species is known, from the depths of the Mediterranean, *Al. rostratus*, Risso, 2nd edit. f. 27., and Mém. de l'Ac. de Turin XXV. pl. x. f. 24.

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[1] *Esox truttaceus*, Cuv.; *Esox alepidotus*, Forst.

MICROSTOMA, *Cuv.*

Have the muzzle very short, the lower jaw more advanced, furnished, as well as the small intermaxillaries, with very fine teeth; three broad and flat rays to the gills; the eye large, the body elongated, the lateral line furnished with a range of strong scales; there is a single dorsal a little behind the ventrals. They have the same sort of intestines as the pike.

But a single species is known, from the Mediterranean, the *Serpe microstome,* Risso, p. 356.

STOMIAS, *Cuv.*

The muzzle extremely short, the mouth cleft almost to the gills, the opercula reduced to small membranous leaflets, and the maxillaries fixed to the cheek; the intermaxillaries, the palatines, and the mandibles are armed with a small number of long and bent teeth, and there are similar small teeth over the tongue. Their body is elongated, their ventrals altogether behind, and their dorsal opposite to the anal on the posterior extremity of the body.

Two species of these singular fishes are known, discovered by M. Risso in the Mediterranean; black, ornamented all along the belly with several ranges of silvery points: the one, *Esox boa,* Risso, 1st edit. pl. x. f. 34. and 2nd edit. f. 40., has no barbels; the other, *Stomias barbatus,* has a very long and thick one hanging under the symphysis of the lower jaw.

CHAULIODUS, *Schn.*

As far as may be judged by a single figure (Catesby, Suppl. pl. ix. Schn. pl. lxxxv.) these fishes possess considerable affinities with stomias in the head and jaws. Two teeth in each jaw cross over the opposite jaw when the mouth is closed; the dorsal corresponds to the interval of the pectorals and of the ventrals, which are much less farther back than in stomias, and the first ray of this dorsal is elongated into a filament.

As yet but a single species has been found, in the neighbourhood of Gibraltar, *Chauliodus Sloani,* Schn. pl. lxxxv.; *Esox stomias,* Shaw, V. part i. pl. iii., fifteen or eighteen inches in length, and of a deep green[1].

SALANX[2], *Cuv.*

The head is depressed, the opercula folding back underneath, four flat rays to the branchiæ, the jaws short and pointed, each furnished with a range of bent teeth, the upper almost wholly formed by the intermaxillaries, without pedicles; the lower jaw is a little elongated from the symphysis, by a small appendage furnished with some teeth; the palate and the bottom of the mouth are entirely smooth: no lingual projection is even visible[3].

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[1] The *Stomias Schneideri,* Riss. 2nd edit. p. 37. appears to me to be of another genus, and even of another order.

[2] *Salanx,* a Greek name of an unknown fish.

[3] There is but one species as yet known.

BELONE, *Cuv.*

In these fishes the intermaxillaries form the whole edge of the upper jaw, which is prolonged, as well as the lower, into a long muzzle; both jaws are furnished with small teeth; there are no other teeth in the mouth; those of the pharynx are *en pavé.* The body is elongated, and clothed with scales not very apparent, except a longitudinal range carinated on each side near the inferior edge. They differ little from the pikes in their intestines. Their bones are very remarkable for their fine green colour[1].

We have one species near our coasts two feet long, green above, white underneath, which constitutes a good dish, notwithstanding the prejudice inspired by the colour of its spines. *Esox belone*, L., Bl. 33. (the Sea-pike or Gar-fish). There are kindred species in all seas. It is reported that one of them arrives to the length of eight feet, and that its bite is dangerous[2].

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[1] This colour is inherent in the bones, and depends neither on the cooking nor on the spinal marrow, as Bloch imagined, Ed. de Schn. p. 391.

[2] The *Brochet de Bantam*, Renard, part ii. fol. 14. No. 65; the *Belone crocodila*, Lesueur, Ac. Sc. Nat. Philad. I. 129, probably the same as the *Wahla kuddera*, Russell 175, and as the variety of the *Orphie* (*Belone*), Lacép. VII. pl. v. f. 1. Add *Belone caudimacula*, N., *Kuddera*, A. Russell 176.; *Belone cancila*, Ham., Buch. xxvii. 70.; *Belone argalus*, Lesueur, loc. cit. p. 125.; *Bel. truncata*, Id. p. 126.; *Bel. caribœa*, Id. 127., which, perhaps, is the *Timucu* of Marcgrave 168.; and other species which we shall describe in our Ichthyology.

SCOMBER-ESOX, *Lacép.* SAÏRIS, *Rafin.*

The same structure of muzzle as Belone, and pretty nearly the same appearance, and the same scales, with the carinated range along the belly; but the last rays of their dorsal and anal are detached in false fins, as in the mackerel.

There is one of them in the Mediterranean, the *Scombrésoce campérien,* Lac. V. vi. 3; *Esox saurus,* Bl., Schn. pl. lxxviii. 2; *Saïris nians,* Rafin. Nuov. gen. ix. 1[1].

HEMIRAMPHUS, *Cuv.*

The intermaxillaries form the edge of the upper jaw, which, as well as the edge of the under, is furnished with small teeth; but the upper is very short, and the symphysis of the under is prolonged into a long point, or semi-beak, without teeth. In other respects, in their port, their fins, and their viscera, they resemble Belone. Their scales are tolerably large, and round, and there is a range of them carinated along the belly.

Several species of hemiramphus are found in the warm latitudes of both hemispheres; their flesh, though oily, is agreeable to the taste[2].

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[1] Add *Scomber-esox equirostris,* Lesueur, Ac. Sc. Nat. Philad. I. 132. *Sc. scutellatus,* Id. ib.

[2] Species of India: *Hemir. longirostris,* Cuv., or *Kuddera,* C., Russell 178. *H. brevirostris,* or *Kuddera,* B., Russell 177, Willughb. App. Bl. vii. f. 1. *H. marginatus,* Cuv., Lacép. V. vii. 2. *H.*

EXOCETUS, *L*[1].

Are to be instantly recognized among the abdominal fishes, by the exceeding size of their pectorals, sufficiently extended to support them for some minutes in the air. Their head and body are scaly, a longitudinal range of carinated scales forms a salient line at the bottom of each flank, as in Belone, Hemiramphus, &c.[2] Their head is flatted above, and at the sides; their dorsal is placed above the anal, their eyes are large, their intermaxillaries without

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Commersonii, Cuv., Lacép. V. vii. 3; or the *demi-bec de Baggewaal*. Renard, part II. pl. v. No. 21.

Species of America: *H. Brasiliensis*, Cuv., or *Esox Brasiliensis*, Bloch 391. *H. hepsetus*, or *Es. hepsetus*, Bl., Schn., and others which we shall describe in our history of fishes. *See* also the article of M. Lesueur, Journ. des Sc. Nat. de Philad. I. 134, &c.

N.B. M. de Lacépède unites the *Esox hepsetus* of Lin. to the *Es. marginatus*; but the *Esox hepsetus* is a compound of two fishes; one, the *piquitinga* of Marcgr. 159, (the *mænidia* of Brown, Jam. xlv. 3.) is an anchovy; the other, Amœn. Ac. I. p. 321, appears to me indeterminable, but cannot be an *hemiramphus*.

[1] Ἐξώκοιτος (lying out), the Greek name of a fish, which, according to the report of the ancients, was in the habit of coming to repose upon the shore. It was probably some Gobius, or Blennius, as Rondelet and others have conjectured. It is impossible to comprehend how Artedi could have associated our present fishes to these blennies. Linnæus has separated them, preserving this name of *Exocetus*, which did not belong to them.

[2] This carinated range must not be confounded, as Bloch has done with the lateral line, which is at its usual place, though often but slightly marked.

pedicles, and forming of themselves the edge of the upper jaw; their two jaws are furnished with small pointed teeth, and their pharyngeal bones with teeth *en pavé*.

There are six rays to their gills; their natatory bladder is very large, and their intestine straight, and without cœca. The superior lobe of the caudal is the shortest. Their flight is never very long; rising into the air to escape from the voracious fishes, they soon fall back, because their wings only serve the purpose of parachutes. The birds pursue them in the air, as the fishes do in the water. They are found in all seas, hot and temperate.

We have one which is common enough in the Mediterranean, to be recognized by the length of its ventrals, placed farther back than the middle of the body. It is the *Exocetus exiliens*, Bl. 397. The young individuals have black bands upon their fins[1].

The most common species in the ocean, *Ex. volitans*, Bl. 398, has the ventrals small, and placed before the middle[2].

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[1] Such was the little individual from Carolina, described by Linnæus, and, as I believe, the *Exocetus fasciatus*, Lesueur, Ac. Sc. Nat. Philad. II. pl. iv. f. 2, but the second *pirabebe* of Pison is the *volitans*.

[2] I see by the drawings of Commerson, and by that of White (Botan. Bay, App. p. 266), as well as by the communications of our recent travellers, that some of both forms are to be found in the Pacific Ocean.

N.B. The *exiliens* and the *mesogaster*, Bl. 329, resemble very

The seas of America produce some with barbels, sometimes simple [1], sometimes double, and even branched [2].

We place at the end of the family of the Esoces, a genus which differs little from them, but which has the intestines longer, and two cœca. It will very probably give occasion to form a particular family. It is that of

MORMYRUS, *L.* [3]

These are fishes with compressed, oblong, scaly body; tail, slender at the base and enlarged towards the fin; the head is covered with a naked and thick skin, which envelopes the opercula and the rays of the gills, and leaves for their aperture only a vertical cleft, which has caused some naturalists to deny their opercula, though they have them as complete as any fish; and to reduce to a single one their branchial rays, although they have five or six. The aperture

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much. It is not easy to distinguish them in the relations and the figures given by travellers. The *evolans* of Linnæus appears to be only a *volitans* whose scales had fallen.

[1] *Exocetus comatus*, Mitch. Trans. New York, I. pl. v. f. 1., probably the same as the *Ex. appendiculatus*, Will. Wood, Ac. Sc. Nat. Philad. IV. xvii. 2.

[2] *Exocetus furcatus*, Mitch. op. cit. f. 2, which I suspect to be the same as the *Ex. Nuttalii*, Lesueur, Sc. Nat. Phil. II. iv. 1.

[3] Μορμυρός, the Greek name of a fish of the littoral sea, and varying in colour; probably the *Sparus mormyrus*, L. It has been applied erroneously enough by Linnæus to fishes of the fresh water, and of an uniform colour.

of their mouth is very small, almost like those mammifera named ant-eaters; the maxillaries form its angles; some slender teeth, emarginated at the end, furnish the intermaxillaries and the lower jaw, and there is upon the tongue, and under the vomer, a long band of small and crowded teeth. The stomach is like a rounded sac, followed by two cœca, and a long and slender intestine almost always enveloped in much fat. The bladder is long, ample, and simple.

The *mormyri* are ranked among the best fishes of the Nile.

Some have the muzzle cylindrical, and the dorsal long[1].

Others have the muzzle cylindrical, and the dorsal short[2].

We may believe, with M. Geoffroy, that it is in one or the other of these subdivisions that we should look for the *oxyrhincus,* so much revered by the ancient Egyptians.

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[1] The *Morm. d'Hasselquist*, Geoff. Poiss. du Nil. pl. vi. f. 2. *Mormyrus caschive*, Hasselq. 398, which appears to me different from the preceding in several essential points, as far as may be judged from its description. The *Morm. oxyrinque*, Geoff. pl. vi. f. 1, which is the *centriscus niloticus*, Schn. pl. xxx. *Mormyrus cannume*, Forsk. 74, the description of which appears to me not to agree with any of the preceding species.

[2] The *Morm. de Denderah*, or *anguilloïdes*, L., Geoff. pl. vii. f. 2, erroneously confounded with the *caschive* of Hasselquist, by Linnæus, but which is the *Hersé*, Sonnini, Voy. en Egypte, pl. xxii. f. 1.

Others again have the muzzle short and rounded, and the dorsal short[1].

Finally, there are some in which the forehead forms a gibbous projection in front of a mouth placed farther back[2].

The third family of Malacopterygii Abdominales, or that of

SILUROIDES,

Is distinguished from all the others of this order, by having no true scales, but only a naked skin, or large osseous plates. The intermaxillaries suspended under the ethmoïd, form the edge of the upper jaw, and the maxillaries are reduced either to simple vestiges, or are elongated into barbels. The intestinal canal is ample, folded, and without cœca; the bladder large, and adhering to a peculiar osseous apparatus. The dorsal and the pectorals have almost always a strong articulated spine for the first ray, and there are often three more behind an adipose, as in the salmones.

Silurus, *L.*[3]

These fishes form a numerous genus, which is recognized by its nudity, by the mouth cleft at the end of the muzzle, and, in the greater number of subgenera, by the strong spine which forms the first ray of the pectoral. This is so articulated on the bone of the shoulder, that the fish can at will approximate it to the body, or fix it perpendicularly in an immoveable position. It then constitutes a dangerous weapon, and in many countries its wounds are considered venomous, doubtless because tetanus, or locked jaw, is apt to supervene on their infliction.

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[1] The *Mormyr. de Salheyhe*, *M. labiatus*, Geoff. pl. vii. f. 1. The *M. de Belbeys*, *M. dorsalis*, Id. pl. viii. f. 1, which is the *Kaschoué*, Sonn. pl. xxi. f. 3.

[2] The *Morm. bané*, or *M. cyprinoïdes*, L., Geoff. pl. viii. f. 2.

N.B. There are in the Nile, and in the Senegal, many other species of *mormyrus* not yet published.

[3] *Silurus* and *Glanis* are two ancient names, sometimes consi-

The head of the siluri, moreover, is depressed, the intermaxillaries suspended beneath the ethmoïd, and not protractile; the maxillaries very small, but almost always continued each into a fleshy barbel, which is joined by other barbels, attached to the lower jaw, or even to the nostrils. The operculum of their branchiæ is deficient in that piece which we have named *suboperculum*. The natatory bladder is strong, and heart-shaped, adhering by its two superior lobes to a peculiar osseous apparatus, which is attached to the first vertebra. The stomach is a fleshy cul-de-sac, the intestine long, ample, and without cœca[1]. These fishes abound in the rivers of warm climates. Grains

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dered as synonyms, sometimes taken for different species, and given to fishes of the Nile, the Danube, the Orontes, and some rivers of Asia-Minor. There is no doubt that they do not belong to this genus.

[1] Hasselquist attributes cœca to the *Schilbé*, but I have assured myself of the contrary.

or seeds are found in the stomach of several species. In

SILURUS (properly so called) *Lacép.*,

There is but one small fin with few rays on the fore part of the back, but the anal is very long, and extends very nearly to the caudal.

SILURUS, (more especially so named) *Artedi.* and *Gronov.*,

Have the dorsal small, without any sensible spines; the teeth are ranged as on a card in both jaws, and behind the intermaxillary band of these teeth is a vomerian band. Such is

Silurus glanis, L., Bl. 34; *Saluth.* of the Swiss; *Wels* or *Scheid* of the Germans; *Mal* of the Swedes. The largest of the fresh-water fishes of Europe, and the only one of this great genus, found in this quarter of the globe. Smooth, greenish black, spotted with black above; yellowish white underneath, with the head thick, and six barbels. It is sometimes six feet and more in length, and weighs, according to report, as much as three hundred pounds. It is found in the rivers of Germany, of Hungary, in the lake of Haarlem, &c. It conceals itself in the mud to lie in wait for its prey. Its flesh is fat, and its lard is employed in some places for the same purposes as that of the hog[1].

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[1] Add *Sil. fossilis*, Bl. 370. 2. *Sil. bimaculatus*, Id. 364. *Wallagoo*, Russel, 160. *Sil. attu*, Sch. 75. The *Sil. Chinois*, Lacép. V. ii. 1. *Sil. asotus*, L. Pallas. Nov. Act. Petrop. I. xi. 2.

N.B. From an inspection of the dried individual, I find that the

SCHILBE

Differ from the siluri proper, in having the body compressed vertically, and a strong and dentated spine at the dorsal. Their small and depressed head, the nape of the neck suddenly raised, and the eyes situated very low, give them a singular appearance.

The only species yet known belongs to the Nile, and its flesh is less disagreeable than that of the other siluri of this river. They have eight barbels [1].

We may form a new subgenus of some American species, with a round, blunt, small head, provided with barbels, and the eyes almost imperceptible [2].

MYSTUS, *Arted.* and *Lin.* (First editions.)

Are siluri, which, besides their first radiated dorsal, have a second, which is adipose; they are principally composed of the *Pimelodes* and *Doras*, Lacép. [3]

PIMELODUS, *Lacép.*,

Have the body invested solely with a naked skin, without any lateral armature.

This subgenus is still far too numerous in species,

Ompok siluroïde, of Lacép. V. i. 2. is a silurus whose folded dorsal was not observed by the designer.

[1] *Silurus mystus*, Hasselq., Geoffr., Poissons, d'Egypt. pl. ii. f. 3. and 4. *Silurus auritus*, Geoff. Id. f. 1. and 2.

[2] *Silurus candiru*, Spix. x. 1. *Sil. cæcutiens*, Id. ib. 2.

[3] These fishes have received the name of *Machoiran* in the French colonies. Sehn. p. 478, refers it erroneously to the Balista.

and the species are far too different *inter se*, not to oblige us to divide and subdivide it.

We first of all distinguish

BAGRUS,

Which have in each jaw a band of small and crowded teeth, and behind those of the upper jaw a parallel band which appertains to the vomer. The number of their barbels, and the form of their head, serve as characters for subdivision.

Among those which have eight barbels, there are some with an oblong and depressed head [1].

Some have the head broad and short [2].

Among those with six barbels, the most remarkable have the muzzle depressed and broad, as much as, and more so than the pike [3].

Others have the head oval, and its shagreened bones form a sort of helmet [4].

Others have it round and not helmeted, but covered only with a naked skin [5].

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[1] *Sil. Bayad.* Forsk. *Porcus Bayad.*, Geoff., Egypt., Poiss., pl. xv. f. 1 and 2. *Sil. docmac*, Forsk., Geoffr. ib. 3, 4. *Pimelodus aor*, Buchan. xx. 68.

[2] *Sil. erythropterus*, Bl. 369. 2. *Pimel. carasius*, Buchan. xi. 67. *Pim. gulio*, Id. xxiii. 66. *Pim. carcio*, Id. i. 72. *Pim. nangra*, Id. xi. 63?

[3] *Sil. lima*, Bl., Schn. *Sil. fasciatus*, Bl. 366, and divers new species. Spix forms of this division his genus SORUBIM.

[4] *Pimélode abouréal*, Geoff., Egyp. Poiss. pl. xiv. f. 3. and 4. *Pimel. bilineatus*, *Deddi-Jallah*, Russel, 169.

[5] These species are new.

Some are remarked for a depressed head, eyes situated very low on its sides, and an extremely small adipose dorsal. They very much resemble SCHILBE [1].

Finally, there are Bagri, which have but four barbels [2].

PIMELODUS (properly so called),

Have no band of teeth at the vomer parallel to that of the upper jaw, but there are frequently some in the palatines. These fishes exhibit, in the number of their threads, and in the forms of their head, varieties yet more numerous than those of the bagri.

Thus, among those which have but a single band of teeth, some are observed to have the head helmeted, and a distinct osseous plate, or buckler, between the helmet and the spine of the dorsal [3].

Others, in which the buckler is united to, and forms but a single body, with the helmet, which thus extends from the muzzle as far as the dorsal [4].

There are others, in fine, which have the head oval, invested solely by the skin, through which the bones do not appear, and in this group some have six barbels [1].

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[1] Spix forms of these his genus HYPOPHTHALMUS, of which there are two species: *Hyp. edentatus*. ix.; *Hyp. nuchalis*, xvii.

[2] *Sil. bagre*, Bl. 365. *Sil. marinus*, Mitch.

[3] *Sil. clarias*, Bl. XXXV. i. 2. *Pimel. maculatus*, Lacép. v. p. 103. *Sil. hemiolioplerus*, Bl., Schn.

[4] New species.

The others have eight [2].

There are some with a naked and very broad head, which are known under the name of *cats* (*chats*), and their barbels, or cirrhi, are also sometimes six in number [3]: sometimes they are eight [4].

Some should be distinguished from the rest by a small flat head, dorsals also extremely small, and teeth nearly imperceptible [5].

Next come those pimelodi, which, besides the band of teeth in the jaw, have plates of teeth to the palatines. These palatine teeth may either be like the pile of velvet, or the teeth of cards, and then the buckler of the nape may be distinct from the helmet [6]: or it may be united to it [7].

These palatine teeth are also sometimes round, like small paving-stones [8].

There are some pimelodi very remarkable for the pectiniform teeth, which form a moveable group within the skin of the cheek [9].

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[1] *Sil. 4-maculatus*, Bl. 368. 2. *Pim. namdia*, Cuv., Marcgr. 149. *Pim. sebæ*, Cuv., Seb. III. xxix. 5. *Pim. pirinamp*, Spix 8.

[2] *Pim. octo-cirrhus*, Cuv., Seb. III. xxix. 1.

[3] New species.

[4] *Sil. catus*, Lin., Catesb. II. xxiii.

[5] New species.

[6] *Pim. herzbergii*, Bl. 367 ? The *Pim. doigt-de-Négre*, Lacép.

[7] New species.

[8] New species.

[9] *Pim. genidens*, Cuv., new species.

There are also some with an elongated muzzle [1].

It is even sometimes pointed, and almost without teeth [2].

These pimelodi with an elongated muzzle conduct us to a still more extraordinary group of

SYNODONTIS [3], *Cuv.*

The muzzle is narrow, and the lower jaw supports a packet of teeth very much flatted laterally, terminating in hooks, and suspended each by a flexible pedicle ; a species of dentition of which no other example is known. The rude helmet, formed by the cranium of these fishes, is continued without interruption, with an osseous plate, which extends as far as the base of the spine of the first dorsal, a spine which is very strong, as are also the spines of the pectorals. Their inferior barbels, or cirrhi, and sometimes even the maxillaries, have lateral barbs. These fishes are found in the Nile and in the Senegal. Their flesh is held in no esteem [4].

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[1] The *Karasche* (*Pim. biscutatus*) Geoffr., Egypt. Poiss. XIV. i. 2. *Pim. gagata*, Buchan. xxxix. 65 ?

[2] *Pim. conirostris*, Cuv.

[3] *Synodontis* is the ancient name of a fish of the Nile, undetermined.

[4] *Silurus clarias*, Hasselquist, very different from the *clarias* of Gronovius and Bloch ; it is the same as the *Sil. schal*, Schn., Sonnini, Voyag. pl. xxi. f. 2 ; or as the *Pimelode scheilan*, Geoff. Poiss. d'Eg. pl. xiii. f. 3 and 4. *Pimelodus synodontes*, Geoff. Ib. xii. f. 5. *Pimelodus membranaceus*, Id. ib. f. 1 and 2. N.B. *Schal* is their generic name in Lower Egypt, *Gurgur* in Upper Egypt.

AGENEIOSUS, *Lacép.*,

Have all the characters of the pimelodi, except that they want barbels, or cirrhi, properly so called.

In some, the maxillary bone, instead of being prolonged into a fleshy and flexible barbel, sticks up like a dentated horn[1].

In others it makes no projection, and remains concealed under the skin. The dorsal and pectoral spines are not very apparent[2].

DORAS, *Lacép.*,

Are *Machoirans*, or *Mysti*, that is siluri with a second adipose dorsal. The lateral line is cuirassed with a range of osseous pieces, raised each with a spine or projecting keel. Their dorsal and pectoral spines are very strong, and powerfully dentated. Their helmet is rough, and is continued as far as the dorsal, as in the *schals*, and their humeral bone forms a point behind.

Some have only the band of small and crowded teeth in the upper jaw[3].

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[1] *Silurus militaris*, Bl. 362.

[2] *Sil. inermis*, Bl. 363, Seb. III. xxix. 8. *Pimel. silondia*, Buchan. vii. 50.

N.B. The *Silurus ascita*, L., ad. fr. pl. xxx. f. 2. 2. is but a common pimelodus, issuing from the egg, the yolk of which has not yet completely re-entered the abdomen. Linnæus has taken this yolk for an ovary, and his error has been paraphrased by Bloch; by a typographical error also Linnæus has attributed four barbels to the upper jaw: his figures place them at the lower.

[3] *Silurus costatus*, Lin., Bl. 376, and Gronov. v. 1, 2, which is

Others have the muzzle pointed, and no teeth, or teeth scarcely perceptible. Their maxillary barbels sometimes have lateral setæ [1].

HETEROBRANCHUS, *Geoff.*,

Have the head furnished with a rough, flat buckler, and broader than in any other silurus, because the frontals and parietals give out lateral plates, which cover the orbit and the temple; the operculum is still smaller in proportion than in the preceding genera, and what distinguishes these from all other fishes, is the peculiarity observed by M. Geoffroy, that independently of the ordinary branchiæ, they have apparatus ramified like trees, adhering to the superior branch of the third and fourth branchial arch, and which appear to be a sort of supernumerary gills. For the rest, their viscera resemble those of the other siluri. Their branchial membrane has from eight or nine to thirteen or fourteen rays; their pectoral spine is strong and dentated, but nothing of this is to be found on the dorsal; their body is naked and elongated, as are also the dorsal and anal; there is no spine to the

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also the *Cataphractus Americanus*, Catesb. Suppl. ix., usually cited under *Sil. cataphractus*;—*Sil. carinatus*, Lacép., which appears to me the same as Gronov. iii. 4, 5, also usually cited under *S. cataphractus*, and as the *Klip-bagre*, Marcgr. 174; thus the species of *Sil. cataphractus*, should be reduced to nothing. *Doras granulosus* Valenc. ap. Humb. Obs. Zool. ii. 183.

[1] *Doras niger*, Valenc. loc. cit. or *Corydorus edentulus*, Spix v. *Dor. oxyrhyncus*, Val. Ib.

dorsal; the caudal is distinct; those which are known have eight barbels; they come from the Nile, the Senegal, and from some rivers of Asia. Their flesh is not good.

Some, MACROPTERONOTES, *Lacép.*, CLARIAS, *Gronov.*, have but a single dorsal, altogether radiated.

One of them, the *Sharmuth*, or *Black-fish*, *Silurus anguillaris*, Hasselq. and Linn., is common in Egypt and Syria, and constitutes in this last country a principal article of food[1].

Others have a radiated and an adipose dorsal[2].

PLOTOSUS, *Lacép.*,

Are characterized by a second radiated dorsal, very long, as well as the anal, and both are united to the caudal to form a point as in the eel. Their lips are fleshy and pendant; their throat is armed in front with conical teeth, behind which are globular ones, which at the upper jaw appertain to the vomer. A thick skin envelopes their head, as well as the rest of the body; their branchial membrane has nine or ten rays.

Those which are known come from the East Indies.

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[1] Add *Macropt. magur.*, Buch. xxvi. the same as the *Silurus*, named *anguillaris*, by Patr. Russel, 168. *Silurus batrachus*, Bl. 370. 1, which may well be the same as the *Macropteronote brun*, Lacép. V. ii. 2. The *Hexacircine*, Id. ib. 3, has but six barbels, but we have it only from Chinese drawings.

[2] The *Halé* (*Heterobranchus bidorsalis*), Geoff. Eg. Poiss. du Nil. pl. xvi. f. 2.

They have eight barbels, and behind the anus and the fleshy and conical tubercle common to all the siluri, there is, moreover, a fleshy and ramified appendage, the functions of which must be singular.

Some have the dorsal and pectoral spines dentated and considerable [1].

Others have them almost concealed beneath the skin [2].

CALLICHTHYS, *Lin.*, in first editions. CATAPHRACTUS, *Lacép.*,

Have the body almost entirely cuirassed upon its sides, by four ranges of scaly pieces, and there is also on the head a compartment of these pieces; but the end of the muzzle is naked, as well as the under part of the body; their second dorsal has but a single ray in its anterior edge; their pectoral spine is stout, but the dorsal is weak or short. The mouth is but triflingly cleft, and the teeth almost imperceptible; the barbels are four in number; the eyes small and on the side of the head [3].

These fishes can crawl on dry land for some time, like the eel.

Some have the pectoral spine simply rough [4].

Others have it dentated, like the majority of the siluri [5].

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[1] *Platystacus anguillaris*, Bl. 373. 1; Renard. i. fol. 3. 19.

[2] *Plotosus* canius *~~cœsius~~*, Buchan. xv. 44.

[3] N.B. Bloch unites in his genus CATAPHRACTUS, the *Doras* and *Callichthys*.

[4] *Silurus Callichthys*, Bl. 377. 1.

[5] A new species.

MALAPTERURUS, *Lacép.*,

Are distinguished from all the true siluri, by having no radiated fin upon the back, but only a small adipose one upon the tail, and by wanting altogether the spine to the pectorals, whose rays are entirely soft. Their head, as well as body, is covered with a smooth skin; their teeth are small and crowded, and disposed, both above and below, on a broad crescent, there are seven branchial rays; their jaws and viscera resemble those of the siluri.

But one species is known with six barbels, the head less bulky than the body, which is inflated in front. It is the famous *electric silurus* of the Nile and of Senegal. *Silurus electricus*, L., Geoffr., Poiss. d'Eg. pl. xii. f. 1. Brousson. Ac. des Sc. 1782. The *Raasch*, or *Thunder*, of the Arabs, which gives, like the Torpedo and the Gymnotus, electrical commotions. It appears that the seat of this faculty is a particular tissue situated between the skin and the muscles, and which presents the appearance of an adipose cellular tissue, abundantly provided with nerves.

ASPREDO, *Lin.* (fourth and sixth Ed.) PLATYSTACUS[1], *Bl.*,

Exhibit very peculiar characters in the flattening of

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[1] Under this name of *Platystacus*, Bloch unites *Plotosus* and *Aspredo*; Lacép. leaves the Aspredo with Silurus, but makes a distinct genus of Plotosus.

N.B. We must remove from the whole of this great genus SILURUS: 1°. the *Silurus cornutus*, Forsk. p. 66, which has furnished their head, and the enlargement of the anterior part of the trunk, which particularly results from the breadth of the humeral bones; in the proportional length of the tail; in the small eyes placed at the superior face; in their intermaxillaries inclined under the ethmoid, directed backwards, and supporting teeth only at their posterior edge; finally, in the circumstance that they are the only osseous fishes known, which have no mobility in the operculum, because the pieces which should compose it are cemented to the tympanic bone, and to the preoperculum. The aperture of the gills is formed by a simple cleft of the skin, under the external edge of the head, and their membrane, which has five rays, is adherent every where else. The under jaw is transverse, and the muzzle advances beyond it. The first pectoral ray is armed with thicker teeth than in any other silurus; there is but a single dorsal on the front of the back, whose first ray is not very stout; the

the genus *Macroramphose*, Lacép.; it is nothing but the *Centriscus Scolopax*, L. 2°. The genus *Pogonatus*, Commers. and Lacép. The first species *Pogonatus courbin*, Lacép. v. p. 122, is no other than the *Pogonias*, Lacép. II. xvi. 2, and III. p. 138, and consequently of the family of the Sciænæ; the other, *Pogonatus auratus*, is evidently of the genus *Umbrina*. 3°. The genus *Centronodon*, Lacép., or *Silurus imberbis*, Houttuyn. Act. Haarl. xx. 2. 338; it is in no sense a silurus, since it has scales, prickles to the operculum, the first dorsal spiny, &c. It probably approximates to the perches, and Bloch, very gratuitously Edit. of Schn. p. 110, ranges it among the Sphyrænæ.

anal, on the contrary, is very long, and extends under the whole tail, which is long and slender.

But a few species are known, which have six or eight barbels. It is remarkable, that when there are eight, there is one pair attached to the base of the maxillary barbels; the four of the lower jaw are in pairs one behind the other [1].

We observe in some of these fishes certain globules, which appear to be their eggs, and which adhere to their thorax by pedicles.

LORICARIA, *L.*

Thus named in consequence of the hard and angular plates by which their body and their head are completely cuirassed, are otherwise distinguished from the cuirassed siluri, such as callichthys and doras, by having the mouth pierced under the muzzle. It is with that of synodontis that this mouth exhibits the greatest analogy; small intermaxillaries suspended under the muzzle, and mandibular bones, transverse and not united, support some long and flexible teeth, which terminate in hooks; a broad membranous circular veil surrounds the aperture; the pharyngeal bones are furnished with numerous teeth, *en pavé*. The true opercula are immoveable, as in aspredo, but two small mobile external plates seem to perform their office. The membrane has four rays; the first rays of the dorsal, of the pectorals, and even of the ventrals, are stout spines. Neither cœcum nor air-bladder is to be found. We may form two subgenera of these fishes.

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[1] *Silurus aspredo*, L. *Platystacus lævis*, Bl., Seb. III. xxix. 9 and 10. *Platyst. cotylephorus*, Bl. 372. *Silurus hexadactylus*, Lacép. v. p. 82. The *Platystacus verrucosus*, Bl. 373. 3, differs from the others in having a shorter tail and anal.

HYPOSTOMA, *Lacép.*,

Have a second small dorsal, furnished with a single ray, as in callichthys. Their labial veil is simply papillose, and has a small barbel on each side. They have no plates under the belly; their intestines, spirally convoluted, are as slender as pack-thread, and twelve or fifteen times longer than the body. They are caught in the rivers of South America[1].

LORICARIA (properly so called), *Lacép.*,

Have but a single dorsal in front; their labial veil is furnished on its edges with several barbels, and is sometimes bristling with villosities; their belly is furnished with plates underneath; their intestines are of a moderate thickness[2].

The fourth family of the Abdominal Malacopterygii, or that of

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[1] *Loricaria plecostomus*, L., Bl. 374. *Hyp. etentaculatum*, Spix iv.

[2] *Loricaria cataphracta*, Linn.; or *L. cirrhosa*, Bl., Schn., and *Setigera*, Lacép., Bl. 375. 1, 2. *Loric. rostrata*, Sp. iii. *Rinelepis aspera*, Id. ii. *Acanthicus hystrix*, Id. i.

SALMONIDÆ,

Formed in Linnæus but a single great genus, precisely characterized by a scaly body, and a first dorsal with soft rays, followed by a second, which is small and adipose, that is, formed simply by a skin filled with fat, and not supported by rays.

These fishes have numerous cœca, and are provided with a natatory bladder. Almost all of them ascend rivers, and their flesh is excellent. The structure and armature of their jaws vary most surprisingly.

This great genus,

SALMO, *L.*,

Should be subdivided as follows:

SALMO, *Cuv.* (The SALMONS proper, or rather TROUTS),

Have a considerable portion of the edge of the upper jaw formed by the maxillaries, a range of pointed teeth in the maxillaries, the intermaxillaries, the palatines, and the mandibularies, and two ranges on the vomer, on the tongue, and the pharyngeals, so that they are the most completely dentated of all fishes. In the old males, the end of the lower jaw is curved towards the palate, where there is a fossette to lodge it when the mouth is closed. Their form is universally known. Their ventrals correspond to the middle of their first dorsal, and the second or adipose dorsal corresponds to the anal. Their branchial rays are ten in number or thereabouts. Their stomach, long and narrow, forms a fold, and is followed by very numerous cœca; their natatory bladder extends from one end of the abdomen to the other, and communicates above with the œsophagus; their body is almost always spotted, and their flesh in general is very good.

They reascend into rivers for the purpose of spawning, jumping even over cataracts; and some are to be found even in the rivulets and small lakes of the highest mountains.

Salmo salar, L., Bl. 20. (the salmon), is the largest species of the genus, with red flesh, and irregular brown spots, which are very speedily effaced in the fresh water; the cartilaginous hook formed by its under jaw is not very considerable even in the old male. This fish comes from all the Arctic Seas, from whence it enters in large shoals into the rivers in spring. Its fishery is very important in all the northern countries, where quantities of salmon are salted and dried.

Salmo hamatus, Cuv., Bl. 98, is spotted with red and black on a whitish ground; the muzzle of the male is narrowed into a point, and the hook of the lower jaw is much more marked than in the salmon. Its teeth are stronger; its flesh is also red, but thinner, and less esteemed. It is also caught in the mouths of our rivers.

Salmo Schiefermulleri, Bl. 103. (sea trout), less than the salmon, with teeth more slender and longer, the flanks sown with little spots of a crescent-shape on a silvery ground. Its flesh is yellow: a considerable quantity of it is imported among us in summer.

Salmo hucho, L., Bloch 100, and better, Meidinger 45, which becomes almost as large as the salmon, differs little from the preceding in its spots, but has the muzzle more pointed, and the teeth much stronger.

As for the other river trouts, they are to be found in all limpid waters, especially in mountain streams. They differ much in size and colour, and several naturalists have thought that they could distinguish certain species among them, while others maintain that they are simple varieties, the result of age, nutriment, and particularly of the character of the waters in which they sojourn. But I find that this supposition has been carried beyond the bounds of probability.

Salmo Lemanus, Cuv. (great trout of the Lake of Geneva), which is also found in some neighbouring lakes, with the head and back sown with some small round and blackish spots, on a whitish ground. Its flesh is very white. There are some of forty and fifty pounds weight.

Salmo trutta, L., Bl. 21, (salmon-trout), is marked with ocellated spots, or in the form of an X, and the upper ones are sometimes surrounded with a closer circle; there are many of these spots on the opercula and the adipose dorsal; the flesh is reddish. The streams of clear waters, which disembogue immediately into the sea, are the waters in which the best are caught. But some of them ascend to all heights and distances from the sea.

Salmo fario, L., Bl. 22, (the common trout), smaller, with brown spots on the back, red on the flanks; surrounded with a clear circle, but varying infinitely in the tints of the ground, from white and golden yellow, to a deep brown; the flesh is white. This trout is common in all streams where the water is clear and lively.

Salmo punctatus, Cuv., *S. alpinus*, Bl. 104; but not the *alpinus* of Lin. The *Carpione* of the lakes of Lombardy; is sown with small black and red spots; it is found all round the Alps; its flesh is delicious.

Salmo marmoratus, Cuv.; with spots and irregular brown marks, crowded and mixed so as to form a sort of marbling. From the lakes of Lombardy.

Naturalists are more agreed in separating

Salmo salvelinus, L., Meidinger 19, under the name of *Alpinus*, (the red trout, charr, of the English) which has red spots upon the flanks, the belly orange, the anal and the pectoral fins red; their first ray is thick, and white.

Salmo alpinus, Linn., Bl. 99, and Meidinger 22, under the name of *Salvelinus* (Alpine trout); pretty nearly of the same colours; but the first rays of its inferior fins are not distinguishable. It abounds in the mountain lakes of Lapland, and constitutes a valuable resource for the Laplanders in summer.

There is also in our rivers a small trout,

The *Salmlet* of the English, *Saumoneau* of the

Rhine, Penn., Zool. Britt. III. pl. lix. 1; which many believe to be distinct, the greenish of the back forms, with the white of the belly, zig-zags, in each of which is a red spot. It is a small and delicious fish.

Salmo umbla, L., Bl. 101. The scales are smaller, and the teeth finer than in the others; its spots are but slightly marked, and are often wanting; its flesh, though more fat and white, approximates to that of the eel. The umbla of the Lake of Geneva is particularly celebrated [1].

OSMERUS, *Arted.*,

Have two ranks of separated teeth in each palatine; but their vomer has but a few on the front. For the rest, their forms are the same as those of the trouts, but the membrane of their gills has but eight rays. Their body is without spots, and their ventrals correspond to the anterior edge of their first dorsal. They are taken in the sea and in the mouths of great rivers.

But a single species is known, brilliant with the finest tints of silver and transparent green. It is most excellent eating. *S. Eperlanus,* L., Bl. 28. 2. (the smelt).

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[1] Besides these salmons and trouts of our rivers, the Russian and American naturalists have described several, but which have not been sufficiently compared with ours, so little so, that even Pallas expresses some doubts respecting the authenticity of certain of his species. We shall strive to clear up their synonymy in our great work on Ichthyology; but the details into which such a research would oblige us to enter, can have no place here. In the other work we shall also publish several North American species, part of which have been already indicated by Messrs. Mitchill, Lesueur, Rafinesque, Richardson, &c.

MALLOTUS, *Cuv.*,

With the cleft mouth of the preceding, have only even, small, and crowded teeth at the jaws, palate, and tongue. Their gills have eight rays; their body is elongated and covered with small scales; their first dorsal and ventrals are farther back than the middle; they are particularly recognized by the broad round pectorals which almost touch one another underneath.

But one species is known, which belongs to the northern seas. *Salmo Grœnlandicus,* Bl. 381; the *Capelan,* Duhamel, Sect. I. pl. xxvi.; *Clupea villosa,* Gmel.; a small fish which has been employed as a bait in the cod-fishery. The male, in the spawning time, has a broad band all along the flank, furnished with long, narrow, and raised scales, which have the appearance of hairs.

THYMALLUS[1], *Cuv.*,

Have the same structure of jaw as the trouts, but their mouth is but very slightly cleft, and their teeth are very fine; their first dorsal is long and high, and they are further distinguished by their larger scales;

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[1] N.B. Artedi united this genus and our Coregonus, in his genus COREGONUS.

they have, moreover, pretty nearly the same habits as the trouts, and their excellent flavour. Their stomach is a very thick sac; their gills have seven or eight rays.

Salmo thymallus, L., Bl. 24; has the first dorsal as high as the body, and twice as long as it is high; spotted with black and sometimes with red; it is brownish, and striped lengthwise with blackish. Its flavour is excellent[1].

Coregonus, *Cuv.*,

Have the mouth like the preceding, and still less armed, for the teeth are often altogether wanting. Their scales are still larger, but their dorsal is less long than it is high in front.

Europe possesses several species very similar one to another. One of them, however,

Salmo oxyrhincus, L., Bl. 25, under the false name of *Lavaret*, is easily distinguished by a soft prominence at the end of the muzzle. From the north sea, and the Baltic, where it pursues the shoals of herrings. It is also taken in the Schelde, the lake of Haarlem[2], &c.

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[1] Add *Coregonus signifer*, Richardson, first voy. of Captain Franklin, pl. xxvi. *Cor. thymalloïdes*, Id.

[2] A bad figure of this fish sent to Rondelet (Rondel. Fluviat. 195), and to which, I know not how, three dorsals had been drawn, has given rise to the genus Tripteronote, Lacép., which should consequently be suppressed. Schoenefeld had given to it erroneously the name of *Albula nobilis*, and Artedi and Linnæus had confounded it

Salmo marænula Bl. 28, f. 3, and *S. albula,* Ascan. pl. xxix; has also a very determinate character in its lower jaw, which extends beyond the upper[1].

The others have the muzzle obtuse, or as it were truncated; it is very difficult to assign to them precise characters. Such are,

Salmo maræna, Bl. 27; from the lakes of Brandenburgh; its muzzle, although obtuse, advances beyond the mouth.

Salmo Wartmanni, Bl. 105. (the lavaret); from the lakes of Bourget, of Constance, of the Rhine, &c. Its muzzle, or snout, is truncated on a level with the fore part of the mouth; its head is less long in proportion, its form more attenuated.

Coregonus fera, Jurine. Mém. de la Soc. Phys. de Genève, tom. III. part I. pl. vii.; from the lake of Geneva, and some others; it is higher than the lavaret, and its fins are larger.

Coregonus hyemalis, Jurine, ib. pl. viii.; from the lake of Geneva, where it appears only in winter; its head is thicker, and its fins larger in proportion than in the *fera.*

Cor. palæa, Cuv.; from the lake of Neufchatel; it is higher, especially from the nape, than all the preceding; its tints are deeper.

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with the *Lavaret,* in which they have been followed by Bloch. The *Salmo thymallus latus,* Bl. 26, appears to be a variety of the other in the spawning-time.

[1] Add *Salmo clupeoides,* Pall.

Salmo sikus, Cuv., Ascan. pl. xxx. under the name of *lavaret;* from the rivers of Norway; has a prominent muzzle like marœna, but the body is narrower, and more brown[1].

ARGENTINA, *L.*,

Mouth small, and without teeth at the jaws, like Thymallus, but this mouth is depressed horizontally; the tongue is armed as in the trouts and smelts, with strong hooked teeth, and there is a transverse range of small ones in front of the vomer. There are six rays to the gills; the intestines differ but little from those of the trouts.

But a single species is known; from the Mediterranean; *Argentina sphyræna,* L., Cuv. Mém. du Mus. I. xi.; whose natatory bladder is very thick, and singularly charged with that argenteous substance so remarkable in fish. It is employed in colouring pearls. The stomach is remarkable for its black colour[2].

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[1] Add *Salmo silus,* Ascan. xxiv. *Coregonus albus,* Lesueur, Ac. Sc. Nat. Phil. i. p. 35. *Cor. quadrilateralis,* Richardson, Voy. of Capt. Franklin, pl. xxv. f. 2. *Salmo peled,* Pall.

[2] This fish, which is most certainly the *Argentina* of Willughb. 229, and consequently that of Artedi and Linnæus, has constantly a second adipose dorsal, as Brunnich has well observed, Icht. Mass. 79; it should, therefore, be ranged among the salmones. The *Argentina machnata,* Forsk., is nothing but the *Elops. saurus;* such, too, is probably the case with the *Argentina Carolina* of Linnæus, though Catesby, in the figure cited, Car. II. xxiv. has forgotten the dorsal. Gronovius, for his argentina, gives an anchovy, and Pennant a

Artedi, and several of his successors, have united under the name of CHARACINUS, all the salmones which have no more than four or five rays to the gills; but their forms, and particularly their teeth, still vary sufficiently to give rise to several subdivisions. Nevertheless, I find in all of them the numerous cœca of the preceding salmones, with the divided bladder of the cyprini; none of them have teeth upon the tongue like the trouts. We establish the following subgenera:

CURIMATUS, *Cuv.*,

Have all the external form of thymallus, their little mouth, first dorsal above the ventrals, &c. Some of them even resemble certain thymalli in having teeth, which are visible only through the microscope, and differ from them only in the number of their branchial rays[1].

Others have at each jaw a range of teeth directed obliquely forwards, trenchant, and the anterior ones longer; they may be compared to those of Baliste[2].

Scopelus (*Serpe* of Risso); as for the *Argentina glossodonta*, Forsk., it is a peculiar genus, the BUTIRINUS of Commerson.

[1] *Salmo edentulus*, Bl. 380. *S. unimaculatus*, Bl. 381. 3. *S. tæniurus*, Valenc. Ap. Humb. Obs. Zool. ii. p. 166. *S. curima*, Cuv., Marcgr. 156. *Curimate Gilbert*, Quoy and Gaym. Voyage de Freycinet. Zool. pl. xlviii. f. 1; and probably *S. cyprinoïdes*, Gronov. Zooph. No. 378. These are the PACU, Spix, xxxviii. and xxxix. His ANODUS, xl. and xli. differ only in having a mouth a little more cleft.

[2] *Salmo fasciatus*, Bl. 379. *S. Fridericii*, Id. 378.

They come from the rivers of South America.

ANOSTOMUS, *Cuv.*,

Have, with the form of thymallus, and a range of small teeth above and below, the under jaw raised in front of the upper, and gibbous, so that the small mouth has the appearance of a vertical cleft, on the end of the snout or muzzle [1].

GASTEROPELECUS, *Bl.* SERPES, *Lacép.*,

Have the mouth directed upwards, like the anostomi, but their belly is compressed, salient and trenchant, because it is supported by ribs that end towards the sternum ; their ventrals are very small, and very far back ; their first dorsal is over the anal, which is long ; there are some conical teeth in the upper jaw ; in the lower, there are some trenchant and dentated ones [2].

PIABUCUS, *Cuv.*,

The small head and slightly cleft mouth of the curimata, the body compressed, the keel of the belly trenchant, but not dentated, and the anal very long. Their first dorsal corresponds to the commencement of their anal [3].

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[1] *Salmo anostomus*, L., Gronov. vii. 2.

[2] *Gastropelecus sternicla*, Bl. 97. 3.

[3] *Salmo argentinus*, Bl. 382. 1 ; Marcg. 170. *S. bimaculatus*, Bl. 16. *S. gibbosus*, Gronov. Mus. I. i. 1. *S. melanurus*, Bl. 381. 2.

SERRA-SALMES, *Lacép.*,

Already distinguished by M. de Lacépède; body compressed, high vertically, and the belly trenchant, and dentated like a saw, characters to which it is necessary to add that of their triangular, trenchant, and dentated teeth. The maxillary without teeth crosses the commissure obliquely. There is frequently a couchant spine in the front of their dorsal.

Those which are known come from the rivers of South America. It is said that they pursue ducks, and even men who are bathing, and tear away their skin with their trenchant teeth[1].

TETRAGONOPTERUS, *Artedi*,

Have the anal long, and the trenchant and dentated teeth of the serra-salmes; the maxillary without teeth, in like manner, crosses the commissure obliquely; but the mouth is but slightly cleft, and the belly is neither carinated nor dentated[2].

CHALCEUS, *Cuv.*,

Have the same form of mouth, and the same trenchant

[1] *Salmo rhomboides*, Bl. 383. *Serr. piraya*, Cuv., Mém. Mus. V. pl. xxviii. f. 4. *Serras. mento*, Id. ib. f. 3. *Serr. aureus*, Spix, xxix. *S. nigricans*, Id. xxx.

[2] *Tetragonopteros argenteus*, Artedi. Ap. Seb. III. pl. xxxiv. f. 3.; or *Coregonoïdes Amboinensis*, Art. Spec. 44, which has been erroneously confounded with *Salmo bimaculatus*. *Chalceus fasciatus*, Cuv., Mem. Mus. V. pl. xxvi. f. 2. *Serra-salmo chalceus*, Spix, xxxiii. 1.

and dentated teeth as the preceding, but their body is oblong, and neither carinated nor dentated. Their maxillary has very round small teeth [1].

MYLETES *Cuv.*,

Are remarked for very singular teeth, in a triangular prism, short, rounded at the crests, and the upper face of which is hollowed by mastication, so that the three angles there form three salient points. The mouth, but little cleft, has two ranks of these teeth in the intermaxillaries, and a single one at the lower jaw, with two teeth behind; but the tongue and palate are smooth; the maxillaries placed over the commissure have no teeth.

Some of these fishes have the elevated form, the vertical falciform fins, the spine inclining forward, and even the trenchant and dentated belly of the serrasalmes, with which we would willingly unite them, were it not for their teeth. There are some of them which also have the couchant spine in front of the dorsal [2].

Some very large ones are found in America, which are good eating [3].

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[1] *Chalceus macrolepidotus*, Cuv. Mém. Mus. IV. pl. xxi. f. 1. *Ch. opalinus*, Id. ib. V. pl. xxvi. f. 1. *Ch. angulatus*, Spix, xxxiv.

[2] *Myletes rhomboïdalis*, Cuv. Mém. du Mus. iv. pl. xxii. f. 3.

[3] Besides the preceding, *Myl. duriventris*, ib. f. 2. *M. brachypomus*, ib. f. 1. *M. macropomus*, ib. pl. xxi. f. 3. *M. paco*, Humb. Obs. Zool. ii. pl. xlvii. f. 2.

Others have simply an elongated form. Their first dorsal corresponds to the interval of the ventrals and anal.

But one species is known; from Egypt [1].

HYDROCYON, *Cuv.*,

Have the end of the muzzle formed by the intermaxillaries; the maxillaries commence near or in front of the eyes, and complete the upper jaw. The tongue and vomer are always smooth, but there are conical teeth in the two jaws. A large suborbital, thin and naked, as the operculum, covers the cheek.

Some have a crowded range of small teeth at the maxillaries and palatines; their first dorsal corresponds to the interval of the ventrals and the anal [2].

They come from the rivers of the torrid zone; their taste resembles that of the carp [3].

Others have a double range of teeth at the intermaxillaries and the lower jaw, a simple range on the maxillaries, but none on the palatines. Their first dorsal is just above the ventrals [1].

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[1] The *Raii of the Nile*, which is the *Cyprinus dentex*, Linn., Mus. Ad. Fr. and XIIth ed.; or the *Salmo dentex* of Hasselquist, and the *S. Niloticus*, of Forskal, and which is found twice in Gmelin and his followers. It is the *Myl. Hasselquistii*, Cuv., Mém. Mus. IV. pl. xxi. f. 2.

[2] This is the reason why they have been ranged among the *Osmeri* by M. de Lacépède.

[3] *Salmo falcatus*, Bl. 385. *S. odoe*, Id. 386. *Hydrocyon falcirostris*, Cuv., Mém. Mus. V. pl. xxvii. f. 1. *Hydr. hepsetus*, C.; or *Hydr. faucille*, Zool. du Voy. de Freyc. pl. xlviii. f. 2.

Others again have but a simple range to the maxillaries and lower jaw; these teeth are alternately very small and very long, especially the second two below, which pass through two holes of the upper jaw when the mouth is closed. Their lateral line is furnished with larger scales; their first dorsal corresponds to the interval of the ventrals and the anal [2].

A fourth sort has the muzzle very salient and pointed, the maxillaries very short, furnished, as well as the lower jaw and the intermaxillaries, with a single range of small crowded teeth; their first dorsal corresponds to the interval of the ventrals and the anal. The whole body is furnished with stout scales [3].

Others, in fine, have absolutely no teeth whatever, except on the intermaxillaries and lower jaw; these teeth are few in number, stout, and pointed. Their first dorsal is above the ventrals. But a single one is known: from the Nile [4].

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[1] A new species from Brazil. *Hydroc. brevidens*, Cuv., Mém. Mus. V. pl. xxvii. f. 1; or *Characinus Amazonicus*, Spix, xxxv.

[2] Another Brazilian species, *Hydroc. scomberoïdes*, Cuv., Mém. Mus. V. pl. xxvii. f. 2; or *Cynodon vulpinus*, Spix, xxvi. *Cynodon gibbus*, Id. xxvii.

[3] Another species from Brazil, *Hydroc. lucius*, Cuv., Mém. Mus. V. pl. xxvi. f. 3; or *Xiphostoma Cuvieri*, Spix xlii.

[4] The *Roschal*, or *Water-dog*, Forsk.; or *Characinus Dentex*, Geoffr. Poiss. d'Eg. pl. iv. f. 1; and Cuv. Mém. Mus. V. pl. xxviii. f. 1; but which is not, as Forskal thought, the *Salmo dentex* of Hasselquist: this latter is the *Raii*.

CITHARINUS, *Cuv.*,

Are recognised by their depressed mouth, cleft crosswise at the end of the muzzle, the upper edge of which is entirely formed by the intermaxillaries, while the maxillaries, small and without teeth, only occupy the commissure; the tongue and palate are smooth, and the adipose fin is covered with scales, as well as the greatest portion of the caudal. They are found in the Nile.

Some have very small teeth in the upper jaw only, the body elevated like the serra-salmones, but the belly neither trenchant nor dentated[1].

Others have, at both jaws, a great number of teeth, crowded in several ranks, slender, and forked at the end; their form is more elongated[2].

SAURUS, *Cuv.*,

Have the muzzle short; the mouth cleft as far as behind the eyes; the edge of the upper jaw formed almost entirely by the intermaxillaries; several very pointed teeth along both jaws, the palatines, the tongue, and the pharyngeals, but none on the vomer; eight or nine, and frequently ten or fifteen rays to the gills. The first dorsal is a little behind the ventrals, which are large; scales on the body, cheeks and opercula; the viscera resemble those of trouts. These fishes belong to the sea, and are extremely voracious.

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[1] The *Serra-salme citharine*, or *Star of the night*, of the Arabs, Geoff. Poiss. d'Eg. pl. v. f. 2 and 3. (*Citharinus Geoffrœi*, C. *Salmo cyprinoïdes*, Gronov., Mus. p. 378.)

[2] The *Characin nefasch*, Geoff. ib. fig. 1; or *Salmo Ægyptius*, Gm.; it is the *Salmo niloticus* of Hasselquist, very different from that of Forskal, which is the *Raii*.

One species is found in the Mediterranean, *S. saurus*, L., Salv. 242 [1].

The lake of Mexico has a species almost transparent, *S. Mexicanus*, Cuv.: another equally transparent, the teeth long, flexible, and partly terminated like barbels, the muzzle exceedingly short, and the fins remarkably brittle, (*S. ophiodon*, Cuv.; *Vana motta*, Russel 171.) is used in the Indies, dried and salted, as a condiment [2].

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[1] Add *S. saurus*, Bl. 384, which appears to me to differ from that of the Mediterranean. *Salmo fœtens*, Bl. 384. 2. *S. tumbil*. Bl. 400. *L'Osmère galonné*, Lacép. V. vi. 1. *Salmone varié*, Id. V. iii. 3. *Osmère à bandes*, Risso., first ed. p. 326. *S. Badi*, Cuv., *Badi motta*, Russel, 172. *Salmo myops*, Forster., Bl., Schn. p. 421. *S. minutus*, Lesueur, Ac. Nat. Sc. Philad. V. part I. pl. v. *S. conirostris*, Spix, xliii. *S. intermedius*, Id. xliv. *S. truncatus*, Id. xlv.; and many new species which we shall describe in our Ichthyology.

N.B. The *Esox synodus*, Gron., Zooph. vii. 1. *Synodus*, Schn. *Synode fascé*, Lacép., appears to me to be only a saurus that had lost its adipose dorsal, the smallness of this fin might easily cause it to disappear, on rubbing, or desiccation.

[2] The *Salmo microps*, Lesueur, Sc. Nat. Philad. V. part I. pl. iii. is, if not the same species, one very much approximating to it. M. Lesueur makes of it his genus HARPODON, because he believed it had teeth in the vomer; but he mistook the pharyngeal teeth for the vomerian, in consequence of the extreme shortness of the muzzle.

Scopelus [1], *Cuv.* Serpes of *Risso.*,

Have the mouth and gills extremely cleft; the two jaws furnished with very small teeth; the edge of the upper entirely formed by the intermaxillaries; the tongue and palate smooth. Their muzzle is very short and obtuse; there are nine or ten rays to the gills; and, besides the usual dorsal, which corresponds to the interval of the ventrals and the anal, there is another very small one behind, in which the vestiges of rays are perceptible.

These fishes are caught in the Mediterranean, intermingled with the anchovies, and they are there named *melettes,* as are other small fishes. One of them, the *Serpe Humboldt,* Risso, pl. x. f. 38, is remarkable for the brilliancy of the silvery points which are distributed along the body and tail [2].

Aulopus [3], *Cuv.*,

Unite the characters of Gadus to those of the Salmones, their mouth is deeply cleft; their intermaxillaries, which form all its superior edge, are furnished, as well as the palatines, the anterior end of the vomer, and the lower jaw, with a narrow band of pectiniform teeth; but the tongue only exhibits some degree of roughness, as well as the level part of the bones of the palate. The maxillaries are large and without teeth, as in the great majority of fishes; their ventrals are almost under the pectorals, and their external rays are thick, and only forked. The first dorsal corresponds to the first moiety of the interval which separates them from the anal. There are twelve rays to the gills. Some large ciliated scales cover the body, the cheeks, and the opercula.

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[1] Σκόπελος is the Greek name of an unknown fish.

[2] I believe this fish to be the same as the pretended *Argentina sphyræna,* of Pennant, Brit. Zool. No. 156, therefore it should also be found in our part of the Atlantic. Add the *Serpe crocodile,* Risso, p. 357. The *Serpe balbo,* Id. Ac. des Sc. de Turin. tome xxv. pl. x. f. 3. But the *Serpe microstome,* p. 356, is certainly of another genus, and of the family of the pikes.

[3] Αὐλωπὸς, the Greek name of an unknown fish.

The Mediterranean produces a single species of this fish, *Salmo filamentosus*, Bl., Berl., Schr. X. ix. 2.

STERNOPTYX, *Herman.*,

Are small fishes with a high and very much compressed body, supported by the ribs; the mouth is directed upwards; the humerals form a trenchant crest in front, terminated below by a small spine; the bones of the pelvis form another, also terminated by a small spine in front of the ventrals, which are small enough to have escaped the first observer. Along the crest of the pelvis, on each side, is a series of small fossettes, which have been regarded as a festooned fold of the sternum, and given rise to the name of Sternoptyx. In front of their first dorsal is an osseous, or membranous crest, which appertains to the anterior interspinals, and behind this fin is a small membranous projection, which represents the adipose fin of the salmones. Their maxillaries form the sides of their mouth.

We have two species which may one day form the types of two subgenera.

Sternoptyx diaphana, Hermann. Naturforscher, fascic, xvi. pl. viii. copied, Walbaum, Arted. renov. tome iii. pl. i. fig. 2. The teeth even, small, and crowded, and five rays to the gills; its form is singularly oblique, the mouth even coming out beyond the vertical line.

Sternoptyx Olfersii, C.; has hooked teeth, and nine rays to the gills; both are found in the warm parts of the Atlantic Ocean[1].

The fifth family of ABDOMINAL MALACOPTERYGII, or that of

CLUPEA,

Is easily recognized by the absence of the adipose dorsal; the upper jaw is formed as in the trouts, at the middle by intermaxillaries without pedicles, and on the sides by the maxillaries; their body is always very scaly. The greater number have a natatory bladder, and numerous cœca. A portion of them only ascend into rivers.

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[1] Our descriptions are from nature. Herman denied the existence of branchial and ventral rays in his species, but his individual, which is still to be seen at Strasburgh, exhibits both. We shall treat more in detail concerning them in our great history of fishes.

Clupea, *L.* (The *Herrings*),

Have two well marked characters in their narrow and short intermaxillaries, which form but a small part of the upper jaw, the sides of which are completed by the maxillaries, so that these sides alone are protractile; and in the inferior edge of the body, which is compressed, and in which the scales form a dentation like that of a saw. The maxillaries, besides, are divided into three pieces. The gills are very much cleft; accordingly it is reported that these fishes die immediately on being taken out of the water. The arches of their gills are furnished on the side of the mouth with long pectiniform dentations. The stomach is an elongated sac; the natatory bladder long and pointed, and the cœca numerous. Of all fishes, they have the most numerous and the finest bones.

Clupea, *Cuv.* (The *Herrings* properly so called),

Have the maxillaries arched in front, and longitudinally divisible into several pieces; the aperture of the mouth is moderate; the upper lip not emarginated.

Clupea harengus, L., Bl. 29. 1. (the common herring), a fish universally known; teeth visible in both jaws; the keel of the belly but little marked, the suboperculum rounded; certain veins on the suborbital, the preoperculum, and the top of the operculum. Its ventrals begin under the middle of its dorsal. The length of its head is one fifth of its total length.

Its anal has sixteen rays.

These celebrated fishes set out every year in summer from the north seas, descend in autumn on the western coasts of France in innumerable legions, or rather in crowded banks of an incalculable extent, they spawn upon the voyage, and arrive almost extenuated at the issue of the channel towards the middle of winter. Entire fleets are occupied in their fishery, which supports thousands of fishermen, of salters, and of traders. The best are those which are taken farthest north; once arrived at the coasts of Lower Normandy, they are empty, and their flesh is dry and disagreeable.

Clupea sprattus, Bl. 29. 2. (the sprat); has the proportions of the herring, but is much smaller. Its opercula are not veined; a golden band is seen along its flanks in the spawning season. It is salted in the north[1].

Clupea latulus, C., Schonefeldt, p. 41. (the white bait); has the body more compressed, and the belly more trenchant than the herring. Its height and the length of its head are each a quarter of the total length. Its dorsal is more advanced; its anal longer, and approaching more to the caudal. It is a very small fish of the finest silvery colour, with a small black spot in the end of the muzzle[2].

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[1] Artedi and his successors have confounded the sprat with the sardine.

[2] Species approximating in form to the white bait: the *Cailleu*,

Clupea pilchardus, Bl. 406; and better, Willugh. pl. i. f. 1. (the pilchard); pretty nearly the size of the herring, but has larger scales; the suboperculum is truncated; there are striæ on the rays to the preoperculum, and particularly to the operculum; the head is shorter in proportion than the herring's, and its dorsal more advanced, so that the distance from the muzzle to the dorsal does not equal the caudal. The ventrals originate under the end of the dorsal. The anal has eighteen rays; two longer scales extend upon each side. Its fishery takes place earlier than that of the herring, and particularly so on the western coast of England.

Clupea Sardina, C., Duham, Sect. III. pl. xvi. f. 4. (the Sardine); is so similar to the pilchard, that no difference can be found, except in its smaller size. It is a fish celebrated for the extreme delicacy of its flavour, and that yields an abundant harvest to the fishermen of Brittany. Quantities of it are also taken in the Mediterranean, where the herring is not known[1].

Duham. Sect. III. pl. xxxi. f. 3. (*C. clupeola*, C.); the *Sardine de la Martinique*, (*C. humeralis*, C.) Duham, ib. f. 4; *C. melanura*, C., Lacép. V. xi. 3. under the name of *Clupanodon Jussieu*, but the description relates to the figure xi. 3. named a variety of the *Clupanodon chinois; Cl. coval*, C., Russ. 186. &c.

[1] We may also separate from the herrings properly so called, the *Jangartoo*, Russel, 191; or *Clupea melastoma*, Schn.; and his *Ditchœe*, 192. which has the dorsal farther back than the ventrals, and a long anal.

ALOSA, *Cuv.*,

Are distinguished from the herrings, properly so called, by an emargination at the middle of the upper jaw. For the rest, they present all the characters of the pilchards and the sardines.

Clupea alosa, L., Duhamel, Sect. III. pl. i. f. 1. (the shad) which becomes much larger and thicker than the herring, and attains nearly three feet in length; is distinguished by the absence of perceptible teeth, and by an irregular black spot behind the gills. In spring it enters the rivers, and is then excellent eating. When taken in the sea, it is dry and ill flavoured.

Clupea finta, Cuv., (Clupea finta, Lacép.); is more elongated than the alosa, and has very well marked teeth in both jaws, and five or six black spots along the flank. It is found even as far as the Nile. Its flavour is much inferior to that of the foregoing[1].

CHATOESSUS, *Cuv.*,

Are herrings properly so called, in which the last ray of the dorsal is prolonged into a filament; some have the jaws equal, and the muzzle not prominent; their mouth is small, and without teeth[1].

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[1] Bloch. pl. xxx. gives, under the name of *Alosa,* a *finta,* whose abdomen was divested of the scales. Add *Cl. vernalis,* Mitch. v. 9. *Cl. æstivalis,* Id. v. 6. *Cl. menhaden,* Id. v. 7. *Cl. matowka,* Id. v. 8. *Cl. palasah.* C., Russel, 198. *Cl. kélée,* Id. 195. *Clupanodon ilisha,* Hamilt. Buchan. xix. 73. *Clupan. champole,* H., Buch. xviii. 74; and his other species, p. 246—251. The genera POMOLOBUS, DOROSOMA, NOTEMIGONUS, of M. Rafinesque, (Poiss. de l'Ohio), must approximate more or less to Alosa, and want teeth; but we are not sufficiently acquainted with them to class them definitively.

Some have the muzzle more salient than the jaws. Their mouth is small, as in the preceding. The upper combs of the first gill are united to those of the opposite side, and form under the palate a very curious pennated point[2].

We place at the end of the true herrings some foreign genera, which approximate to them by their trenchant and dentated belly.

ODONTOGNATHUS, *Lacép.* GNATHOBOLUS, *Schn.*,

Have the body very much compressed, with very sharp dentations as far as the anus; the anal long, and but slightly elevated, a very small brittle dorsal, which is almost always obliterated; six rays to the gills; their maxillary is prolonged a little into a point, and is armed with small teeth, directed forwards. No ventrals have been perceived in them[3].

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[1] The *Cailleu Tassard of the Antilles*, (*Clup. thrissa*, Bloch, 404. f. 3.) Duham, Sect. III. pl. xxxi. f. 3. *Peddakomé*, Russel, 197. *Megalops. oglina*, Lesueur, Sc. Nat. Philad. I. 359. *M. notatus*, Id. 36. *M. cepedianus*, Id. ib.

[2] *Clup. nasus*, Bl. 427; or *Komé*, Russel, 196.

[3] M. de Lacépède having seen only a badly preserved individual, believed that its maxillaries were naturally directed in front of the mouth like two horns; but this was a mere accident: they are placed in this genera as in all the others. It is upon this erroneous idea that the name of *Gnathobolus* has been formed, which signifies *shooting*, or *darting the jaws*.

But one species is known: from Cayenne.

Odontognathe aiguillonné, Lacép. II. vii. 2; has pretty nearly the form of a small sardine, but still more compressed.

PRISTIGASTER, *Cuv.*,

Have the head and teeth like the ordinary herrings; four rays to the gills, and they also appear to want ventral fins; their belly is very much compressed, and forms a trenchant and dentated arch. There are some of them in both oceans[1].

NOTOPTERUS, *Lacép.*

For a long time were placed among the gymnoti, but they approximate more to the herrings. There are scales on the cheeks and opercula; their suborbitals, the lower part of their preopercula, and their interopercula, two crests of the lower jaw, and the keel of the belly, are dentated; their palatines, and both jaws, are armed with fine teeth, and the upper is in a great measure formed by the maxillary; their tongue is furnished with strong hooked teeth. They have but a single ray, but a strong and osseous one to the membrane of the gills; two ventrals, almost imperceptible, are followed by a very long anal, which occupies three-fourths of the length of the body, and is united, as in Gymnotus, to the caudal fin, and on the back, opposite to the middle of this anal, is a small dorsal with soft rays.

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[1] *Pr. tardoore*, C., Russel, 193. *Pr. cayanus*, Cuv., a new species.

One species is known, belonging to the fresh-water ponds of the East Indies, *Gymnotus notopterus*, Pall., Spic. VI. pl. vi. f. 2; *Clupea synura*, Schn. 426; *Notaptère kapirat*, Lacép. [1]

ENGRAULIS, *Cuv.* (The *Anchovies*),

Form a genus sufficiently different from that of the herrings, having the mouth cleft far behind the eyes, and the gills still more open, with rays to the number of twelve or more; a small pointed muzzle, under which are fixed very small intermaxillaries, projects in front of their mouth; the maxillaries are straight and elongated.

The most known do not even possess the trenchant belly; their anal is short, and the dorsal placed opposite to the ventrals.

Cl. encrasicholus, Lin., Bl. 302. (the common anchovy); a span long, with the back bluish brown, flanks and belly silvery; is caught in innumerable quantities in the Mediterranean, and even as far as Holland. It is prepared, after removing the head and intestines, to serve as a sauce, or seasoning. The anchovy thus prepared is in very general use.

Engr. meletta, Cuv., Duham, Sect. VI. pl. iii. f. 5;

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[1] This is certainly the *Tauche de mer*, of Bontius, Ind. 78. but not the *capirat*, or *pangais*, Ren. feuille, xvi. f. 90. which has long ventrals.

is a smaller species of the Mediterranean, with a profile less convex.

America possesses several remarkable species, one of which is without any teeth. *Engr. edentulus,* Cuv., Sloane, Jam. II. pl. ccl. f. 2[1].

Others have, like the true herrings, the body compressed, and the belly trenchant and dentated[2].

THRYSSA, *Cuv.*,

Differ from the anchovies with dentated belly only in the great prolongation of their maxillaries. None are known except from the East Indies[3].

MEGALOPS, *Lacép.*,

Have the jaws formed like the herrings, properly so called, which they resemble also in the general figure and the disposition of the fins; but their belly is not trenchant, nor their body compressed; some close and even teeth furnish their jaws and palatine bones. They have a much greater number of rays to the gills (from twenty-two to twenty-four); and the last ray of their dorsal, and often even of their anal, is prolonged into a filament, as in Chatoessus.

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[1] Add *Engr. lemniscatus,* C.; or *Piquitinga,* Marcgr. 159. Spix xxiii. *Stolèphore Commersonien,* Lacép. V. xii. 1; or *Natoo,* Rus. 187. probably the *Atherina Australis,* White, p. 196. f. 1. *Clupée tuberculeuse,* Lacép. V. p. 460. N.B. His *Clupée raie d'argent* does not differ from his *Stolèphore.*

[2] *Clupea atherinoïdes,* Bl. *Clup. telara,* Buch. II. 72. *Cl. phasa,* Id. p. 240. *Poorwa,* Russel, 194.

[3] *Clupea setirostris,* Broussonet dec. Icht. copied Encycl. 316. *Cl. mystus,* or *Pedda poorawah,* Russel, 190. *Cl. mystax,* Bl., Schn. 83. *Poorawah,* Russel, 189.

America possesses a species, the *Savalle*, or *Apalike*, *Clupea cyprinoides*, Bl. 403, after Plumier, *Cl. gigantea*, Sp. *Camaripu guaçu*, Marcgr., which attains as much as twelve feet in length, and has but fifteen rays to the dorsal; its anal has also a filament. There is another in the East Indies, ignorantly confounded with the preceding; the *Mégalope filamenteux*, Lacép. V. xiii. 3. under the false name of *Apalike*, Russel, 203. It has seventeen rays to the dorsal.

ELOPS, *L.*,

Have all the characters of megalops, but want the elongated filament to the dorsal; their form is a little more elongated. There are as many as thirty rays, and more, to the membrane of the gills; a flat spine arms the upper, and the lower edge of the caudal.

They are to be found in both hemispheres[1].

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[1] The *Elops* of the Indian Ocean is the *Argentina machnata* of Forskal, and the *Mugil salmoneus* of Forster, Bl., Schn. p. 121; I am convinced of this from his figure, though he gives it but four branchial rays. It is also the *Jinagow*, Russel, 179. and the *Synode Chinois*, Lacép. V. x. 1. The *Elops* of America is the *Mugil appendiculatus* of Bosc, or *Mugilomore Anne-Caroline*, Lacép. v. 398; the *Pounder*, Sloane, Jam. II. pl. ccl. f. 1. The *Argentina Carolina*, Linn., is most certainly also the same fish, although he cites but a very bad figure of it, Catesb. II. xxiv.; but the *Saurus maximus*, Sloane, II. pl. ccli. 1. which is generally cited as synonymous with Elops, is altogether of another genus. It is the *Esox synodus*, Lin.; *Synode fascé*, Lacêp., or, what comes to the same thing, one of our Sauri, which had lost its adipose fin.

BUTIRINUS, *Commerson*,

Have, with jaws composed like those of the herrings, and the body elongated and rounded, like elops and megalops, the muzzle prominent as in the anchovies, the mouth but slightly cleft; close and even teeth in the jaws; twelve or thirteen rays to the gills; and, what constitutes their most distinguishing character, the tongue, vomer, and palatines paved with rounded teeth, set closely together.

They are also to be found in both oceans. The elopes and butirini are handsome, silvery fishes, with several small bones, and numerous cœca, which grow very large. These fishes make excellent broth[1].

CHIROCENTRUS, *Cuv.*,

Have, like the herrings, the edge of the upper jaw formed in the middle by the intermaxillaries and on the sides by the maxillaries, which are united to them: both are furnished, as well as the lower jaw, with a range of strong conical teeth, two of which in the middle of the upper range, and all below, are of extraordinary length. Their tongue and branchial arches are bristled with pectiniform teeth, but they have none to the palatines or vomer. Their gills have seven or eight rays, of which the external are very broad. Above and below each pectoral is a long, pointed, membranous scale, and the pectoral rays are very hard. Their body is elongated, compressed, trenchant, but not dentated underneath; their ventrals are extremely small, and their dorsal shorter than the anal, opposite to which it is placed. The stomach is a long, narrow, and pointed sac, the pylorus near the cardia, the natatory bladder long and narrow; I can find no cœca.

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[1] The *Butirin. banane*, of Commerson, Lacép. v. 45., which is also his *Synode renard*, Id. V. pl. viii. f. 2., or *Esox vulpes*, Linn., Catesb. ii. 1. 2. Copied Encycl. 294. is a fish of the Atlantic Ocean on the coasts of America, the same as the *Ubarana* of Marcgrave, Braz. 154., or *Clupea Brasiliensis*, Bl. Schn., as the *Amia* of Browne; as the *Albula gonorhyncus*, Bl. Schn. p. 423., or *Albula Plumieri*, Id. pl. lxxxvi.; as the *Clupée macrocéphale*, Lacép. V. xiv. 1., and as the *Macabi*, Parra, pl. xxxv. f. 4., or *Amia immaculata*, Bl. Schn. 451. Spix has two of them, pl. xxiii. 2. and xxiv. The *Butirinus* of the Indies is the *Argentina glossodonta* Forsk., or *Argentina bonuk*, Lacép., the *Esox argenteus*, Forst. ap. Bl. Schn. 396. Having only seen the American species, I am as yet insufficiently acquainted with the distinguishing characters of these latter.

But a single species is known, of a silvery hue, from the Indian Ocean[1].

HYODON, *Lesueur*,

Have the form of herrings, the belly trenchant, but not dentated; the dorsal opposite the anal, eight or nine rays to the gills, and hooked teeth to the jaws, the vomer, the palatines, and the tongue as in the trouts.

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[1] The *Esoce chirocentre*, Lacép. V. viii. 1., *Sabre* or *Sabran* of Commerson, which is the same fish as the *Clupea dentex*, Schn. p. 428., Forsk. p. 72., or as the *Clupea dorab*, Gmelin, and as the *Wallah*, Russel 199. It is probably also the *Parring* or *Chnees* of the Moluccas, Ren. viii. 55.

Those which are known live in the fresh waters of North America [1].

ERYTHRINUS, *Gronov.*,

Have, like all this family, small intermaxillaries, and the maxillaries forming a great portion of the upper jaw; a range of conical teeth occupies the edges of each jaw, and among those in front there are some larger than the others. Their palatines have each two plates of close and even teeth; there are but five broad rays to the gills; the head is round, blunt, furnished with hard bones, and without scales; the whole cheek is covered with hard suborbitals. The body is oblong, but little compressed, and invested with broad scales, as in the carps. The dorsal corresponds to the ventrals. The stomach is a broad sac, and there are numerous small cœca: the natatory bladder is very large.

These fishes inhabit the fresh waters in warm climates, and their flesh is agreeable [2].

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[1] *Hyodon clodalus*, Lesueur, Ac. des Sc. Nat. de Philad. I. pl. xiv. and p. 367.; *H. tergisus*, Id. ib. p. 366.

[2] *Esox malabaricus*, Bl. 392.; *Synodus erythrinus*, Bl. Schn., Gron. Mus. vii. 6.; *Syn. tareira*, Bl. Schn. pl. 79., Marcg. 157.; *Syn. palustris*, Bl. Schn., *maturaque*, Marcg. 169.; *Erythrinus tæniatus*, Spix. xix.; probably also the *Esox gymnocephalus*, Linn.

N.B. The *Synodus vulpes*, known only from Catesb. II. xxx., appears to me to be the same as the *Butirin banane;* and I believe

Amia, *L.*

Have many relations with the erythrini, in their jaws, their teeth, their head covered with osseous and hard pieces, their large scales, and the flat rays of their gills, but these rays are twelve in number. Between the branches of their lower jaw is a sort of osseous buckler, a commencement of which was already to be observed in megalops and elops; behind their conical teeth are others like small paving stones, and their dorsal, which commences between the pectorals and ventrals, extends nearly to the caudal. The anal, on the contrary, is short: the nostrils have each a small tubular appendage; the stomach is ample and fleshy, the intestine broad and stout, without cœca, and what is well worthy of note, the natatory bladder is cellular, like the lung of a reptile.

But one species is known, from the rivers of Carolina, where it feeds on crabs (*Amia calva,* L. Bl. Schn. 80.). It is seldom eaten[1].

Sudis[2], *Cuv.*,

Are also fresh-water fishes, which have all the characters of erythrinus, except that their dorsal and

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that the *Synodus synodus*, Schn., which is only known from a figure of Gronovius, Zooph. et Mus. vii. 2., is but a *Salmo saurus* which had lost the second dorsal. The *Esox synodus*, Linn., as far as may be judged from its short description, is not the same.

[1] N.B. The *Amia immaculata*, Schn. 451., or *Macabi*, Parra, xxxv. 1. 3. 5. is no other than the *Butirin banane.*

[2] *Sudis*, a name employed by Pliny as synonymous with *sphyræna.*

anal, placed opposite to each other, and pretty nearly equal in size, occupy the last third of the length of the whole body.

We are in possession of one with a short muzzle, brought from Senegal by Adanson, which M. Rüppel has also found in the Nile, *Sudis Adansonii*, Cuv.; and another of very large size, with an oblong muzzle, great osseous scales, and a head simply rough, from Brazil, *Sudis gigas*, Cuv., *S. pirarucu*, Spix. xvi. M. Ehrenberg has discovered a third in the Nile, *Sudis Niloticus*, Ehr., in which he has observed a singular funnel, spirally convoluted, which adheres to the third gill; perhaps it may be some disposition analogous to those which we have observed in the *Anabas* and other neighbouring genera.

Osteoglossum, *Vandelli*,

Have many relations with sudis, and are principally distinguished by two barbels, which depend from the symphysis of the lower jaw; their anal is united to the caudal; their tongue is osseous, and singularly rough, from a multitude of short, straight, and truncated teeth, which cover it, so that it serves like a rasp to reduce fruits to a pulp, or to express the juice from them.

A Brasilian species, tolerably large, is known, *Osteoglossum Vandellii*, Cuv., or *Ischnosoma bicirrhosum*, Spix xxv.

Lepisosteus, *Lacép.*

Have a muzzle formed by the union of the intermaxillaries, maxillaries, and palatines to the vomer and the ethmoid; the lower jaw equals it in length, and both jaws, bristling over their whole interior surface with rasp-like teeth, have along their edge a row of long and pointed teeth. Their gills are united under the throat by a common membrane, which has three rays on each side. They are invested with scales of a stony hardness: the dorsal and anal are opposite one another, and both very far back. The two extreme rays of the tail, and the first of all the other fins, are furnished with scales which cause them to appear dentated. Their stomach is continued as far as a slender intestine, twice folded, having many short cœca to the pylorus: their natatory bladder is cellular, as in amia, and occupies the length of the abdomen. They are found in the rivers and lakes of the warm parts of America[1].

These fishes grow large, and are good for eating[2].

POLYPTERUS, *Geoffr.*

Have the edges of the upper jaw immoveable, and formed in the middle by the intermaxillaries, and on the sides by the maxillaries. An osseous piece chagreened like those of the rest of the head, covers the entire cheek : they have only a flat ray at the gills ; their elongated body is invested with stony scales, as in lepisosteus, and, what at the first glance distinguishes them from all other fishes, is, that they have along the back a great number of separate fins, each supported by a strong spine, which has some soft rays attached to its posterior face. The caudal surrounds the end of the tail, and the anal is very near it ; the ventrals are very far back ; the pectorals are supported on a scaly arm a little elongated. Around each jaw is a rank of conical teeth, and behind some teeth, close and even, or rasp-like. Their stomach is very large, their canal narrow and straight, with a spiral valvule and a single cœcum ; their natatory bladder double, with large lobes, particularly that on the left side, communicates by means of a large hole with the œsophagus.

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[1] I do not believe that the fish of the East Indies, Renard. viii. f. 56. Valent. iii. 459. is, as Bloch will have it, the *Esox osseus*; it is rather a species of *belone*.

[2] *Esox osseus*, Linn., Bl. 390.; the *Lepisostée spatule*, Lacép. V. vi. 2., and the other species or varieties described by M. Rafinesque, Poiss. de l'Ohio, p. 72, &c.

N.B. Under the name of *Esox viridis*, Linnæus appears to have united a description of the *Orphie*, (*Es. belone*) sent by Garden with the fig. of the *Caïman* (*Es. osseus*) given by Catesby II. xxx.

There is one species of this fish with sixteen dorsals, discovered in the Nile by M. Geoffroy, *Polypterus bichir,* Geoffr. Ann. Mus. I. v. ; and another from Senegal, which has but twelve dorsals on the back, *P. Senegalus,* Cuv. Their flesh is good eating.

SUPPLEMENT

ON THE

SECOND ORDER OF FISHES.

MALACOPTERYGII ABDOMINALES.

In our language, and in others, the word *carp* designates a well known fresh-water fish, in high estimation for the table. Ichthyologists in general have considered this fish as the type of the genus CYPRINUS, extremely numerous in species and varieties.

All the species of this genus are fresh-water fish: most of them have the faculty of bringing their lips forward, and drawing them back, in consequence of the anterior part of the mouth being formed of very small bones, connected by elastic ligaments.

The *common carp*, (*Cyprinus carpio*), Lin., is a fish peculiar to the fresh waters of the southern and temperate countries of Europe. It is only in consequence of the pains bestowed by man that any of them are found at present in the more northern regions of this continent. Albert, the first duke of Prussia, imported them into that country during his government. A person named Peter Maschal introduced the carp into England in 1614. In 1560 these fishes were habituated to the waters of Denmark; and not many years subsequently they were reared by the Swedes and the Dutch. But a rigorous climate appears unfavourable to the growth of the carp: the nearer it approaches to the polar circle the more its size diminishes.

In the present day these fish are found in nearly the whole of Europe, in ponds, in lakes, and in rivers with a gentle current. But though, of all fish, they have the least susceptibility and delicacy, though they readily become habituated to changes of situation, the carps experience a marked influence from the nature of the climate, and that of the waters; sometimes they are very abundant in one part of a lake or river, and very rare in another, at no great distance from the former.

The carps generally delight most in waters where the current is not strong. It is in such that their flesh acquires a better flavour, and their bulk becomes most considerable. In certain lakes of Germany it is not uncommon to find individuals weighing about thirty pounds; on the confines of Pomerania, and in Prussia, some have been caught still heavier, as much as forty pounds weight. Pallas informs us that there are carps in the Volga of five feet long, and Valmont de Bomare that one was served on the table of the Prince of Conti, at Offenbourg, weighing forty-five pounds, and four feet long: but the most gigantic carp ever known was that mentioned by Bloch, taken in 1711 at Bischofshause, near Frankfort, on the Oder; it was nine feet in length, three in height, and weighed seventy pounds.

It would appear that these fishes live a prodigious length of time; specimens have been spoken of 150 or 200 years old. Their colour is less deep as they grow older, and in a very advanced age it borders upon white.

When the carps have attained this very advanced age they are subject to a malady which is often mortal; their head and back become covered with excrescences similar to moss. It appears that this disease also occurs to the young carps which live in snow-water or in water which is corrupted: snow-water likewise produces pustulous germs under the scales, which fishermen call the *small pox.* Their intestines also frequently contain worms, and their liver becomes ulcerated.

The carps live habitually on the larvæ of insects, or worms, small testacea, grains, roots, and the young shoots of plants. They are seen to devour the leaves of lettuce and of other succulent and tender plants which are cast into the water. Bloch assures us that the leaves and seeds of salad particularly agree with them, and fatten them more quickly than any other aliment. They are also observed to dart out of the water to seize on the insects which hover over its surface, or which fall into it, such as the achetes, and some species of bombices, in particular that of the willow. In eating, the concussion of their jaws or lips makes a peculiar noise, which may be heard at some distance.

Although the carps can remain a long time without taking any nourishment, nevertheless, when they have food in abundance they eat with so much gluttony as to produce fatal indigestions.

During winter they bury themselves in the mud, and pass many months without eating, assembled in great numbers side by side. But in spring, those which inhabit rivers and streams hasten from their asylums to more tranquil waters, and to places covered with plants. It then generally happens that many males follow a single female, and if in their voyage any barrier should oppose itself to their progress, they endeavour to cross it, and for that purpose sometimes raise themselves to the height of six feet out of the water, by placing themselves on their side, approximating the head and tail together, and then suddenly letting go this sort of circular spring.

Their fecundity is truly astonishing: on this account the ancient Greeks consecrated them to Venus, as their name, *κυπρινος* sufficiently indicates. It appears that from the third year they are in a state to re-produce, and that the number of their eggs increases with their age. Bloch found 237,000 in a female weighing a pound; Petit 342,144 in a female of a pound and a half; Bloch, again, 621,600 in one of nine pounds; and Schneider 700,000 in one of ten pounds, whose ovaria alone weighed three pounds ten ounces.

As is in general the case with the most prolific animals, the greatest portion of the spawn of the carp is often devoured by other fish. The little ones themselves are exposed to a multitude of dangers; but at the age of three years they have no enemies to dread but the larger pikes and the otters. Thus we find that so great a quantity of eggs produces in reality but an ordinary number of fishes. But of all fresh-water fish it would appear that the carp grows the most rapidly; at the end of six years a carp in general weighs about three pounds, at ten from six to eight.

The milt of the males is of a nature not less remarkable than the ovary of the females; M. Renard, who has carefully analyzed it, considers it of a nature altogether particular. It is not only formed of hydrogen, carbon, oxygen, and azote, like other animal substances, it contains besides some phosphorus, which was discovered by MM. Fourcroy and Vauquelin.

Man, with whom the flesh of the carp is an aliment in high estimation, has contrived to rear this fish in a sort of domestic state, and thus to procure it as often as he desires. He has not been contented, however, to place the carps in ponds where he may have them at his disposal, he has also conceived the notion of castrating them, both males and females, for the purpose of fattening them, and imparting to their flesh a more delicate flavour, as is done with oxen and sheep, capons and pullets. From the time of Willughby, and even from that of Gesner, it was a known fact, that the belly of certain fishes might be opened without their perishing, and even without their appearing to be incommoded for any length of time. But it was a countryman of ours, Samuel Full, who reduced this observation to profitable practice; he opened the ovary of the carps, took out the eggs, put a piece of old hat in their place, and united the wound by a suture. He did as much for the milt of the males, taking care in all cases to spare the urethra and the rectum. He communicated this process to Hans Sloane, President of the Royal Society, and the account of it is to be found in the Philosophical Transactions. From this period the experiment has been frequently repeated with success.

The carps may be preserved alive out of water for a considerable time; thus, in winter they may be carried to a very considerable distance by packing them up in plants, in moistened linen, or in snow, and putting in their mouth a piece of bread steeped in brandy; but it is still safer to transport them in boats made expressly for the purpose, and so managed as to allow the water to enter the interior. There are constantly in Paris, where the fresh-water fish are so much more common on the table than in London, in the middle of the river many of these magazines, which are often filled at the distance of more than one hundred leagues from that capital.

In Holland they have a peculiar process for preserving carp alive, and even for fattening them. For this purpose they are suspended to the vault of a cellar, in nets full of humid moss; this vegetable envelope is frequently watered, and they are fed with bread steeped in milk, or with fragments of vegetables.

It would not seem that the ancients held the flesh of the carp in any very high estimation ; none of their authors appear to have celebrated its good qualities: it is in some of the writers of the sixteenth century that we find it first ranked among aliments. In the present day we need not say that it is highly prized, but more especially so in France.

With the eggs of the carp, as with those of the sturgeon, a caviar is prepared which is highly esteemed. In the time of Belon, this preparation was in great request among the Jews of Constantinople, and of the environs of the Black Sea: their religious laws forbad them to eat of the caviar of the sturgeon.

The art of cookery is not the only one for which the carps find employment. The bile of these fishes is employed by painters as a green colour, and was formerly used in medicine.

Monstrous individuals are frequently observed among carps. In the Museum of Paris one is preserved, the mouth of which has no other external orifice than the holes of the gills. Another sort, of extraordinary conformation, which greatly strikes the vulgar, is a particular cut of the muzzle, of which Rondelet, Gesner, and Aldrovandus have given figures, and descriptions and specimens are to be seen in many cabinets. Bloch tells us that he has opened carps which were hermaphrodites, that is, which had eggs in one ovary and milt in the other.

In Germany, according to a great number of ichthyologists, mules of the carp and characinus (one of the salmonides) are frequently met with. Fishermen give them different names. They are recognized by their scales, which are smaller, more attached to the skin than those of the carps, and the head is thicker, shorter, and without barbels.

The *Cyprinus auratus, Gold-fish*, or *Golden carp*, appears to have been originally a native of a lake near the mountain

Tsienking, in China, in the province of *The-kiang*, about the 30th degree of latitude. It is at present extended through the other provinces of China, in Japan, in all Europe, and in America, in consequence of the brilliancy and variety of its colours, which cause it to be brought up in a domestic state. Like all other animals which man has in some degree subjected to himself, it presents varieties almost without number, both of hue and form. The differences, however, of coloration, which are the result of age, must not be numbered among these; in fact, Chinese carp are generally black during the first years of their life. Some silvery points subsequently announce the development of their magnificent dress, which occasionally disappears in old age.

When they live in a spacious pond they may arrive to the length of from eleven to fifteen inches.

They have been brought up in England from the year 1011. The first that were seen in France were brought there for Madame de Pompadour. In China they have been for ages the ornament of the houses and gardens of the rich.

These fishes, when placed in vivaria or in basins, find a sufficient degree of nutriment. If, however, the bottom be sandy, some dung may be thrown in, with some wheaten bread or hempseed. They must also be protected by foliage from the heat of the sun.

If they are kept in glass vessels they are fed with crumbs of bread, yolks of eggs boiled hard, and broken into small fragments, flies, small snails, worms, mince-meat, &c. During summer, the water in the vessels must be renewed nearly every two days, but only once a week or a fortnight in winter.

The golden carp spawn in spring, and multiply extremely. They are not, however, sufficiently extended among us to form an article of food: they are used for the purposes of ornament alone, though, by those who have tasted it, their flesh is said to be of an agreeable flavour.

They possess the organ of hearing in great perfection. The Chinese call them with a whistle to receive their food: thunder, in general, does them much mischief, and even causes them to perish.

The name of *gudgeon* is vulgarly given to a small fish of our rivers which most ichthyologists have referred to the carps, but which forms the subgenus GOBIO in the "Règne Animal."

The colours of the gudgeons vary much, according to age, nutriment, and the nature of the waters which they inhabit. They are found in the rivers and fresh-water lakes of Europe, but more particularly in France and Germany. They abound in places where the bottom is pure and sandy, and which are not much disturbed. In winter they prefer the residence of lakes, and when spring has arrived they re-ascend into the rivers, where they deposit their spawn upon the stones. Their eggs are very small, and of a bluish colour. They do not get rid of them but by degrees, and they frequently employ nearly a month in this operation. Towards autumn they return into the lakes.

Among the gudgeons the number of females is five or six times more considerable than that of the males. These fish live on aquatic insects, worms, and the spawn of other fishes. They are very greedy after any carrion which may be thrown into the rivers. They are taken with the net and with the line, and sometimes so abundantly that in certain countries the people give them to their hogs. In some places also they are introduced into ponds, to serve as food for the pikes and trouts. They multiply with great facility, and live in numerous troops; they have great tenacity of life. Their flesh is tender, very good, and easy of digestion; it is in request on the most delicate tables, and the use of it is prescribed to convalescents.

The TINCA is another dismemberment from the great genus *Cyprinus* of Artedi, &c. The general colour of the *common tench* (*Tinca vulgaris*) varies according to the purity of the waters which it frequents; it is almost black in muddy marshes, and of a very brilliant golden yellow in rapid streams with sandy bottoms. Its tints also vary according to age and sex, to nutriment and climate.

The tench are found throughout the whole globe, in fresh waters, but more especially in lakes and marshes; for they chiefly prefer stagnant and muddy waters. They seldom exceed a foot in length, but some are much larger, and weigh five or six pounds, or even, as Salviani tells us, as much as twenty.

The tench do not dread the rigours of winter, and many naturalists are inclined to think that they pass the months of the cold season buried, and perhaps in a lethargic state, in the sub-aquatic mud.

They feed on the same aliments as the carp, grow rapidly, and multiply much. Their eggs are greenish, small, and so numerous that Bloch has reckoned 297,000 in one female that weighed about four pounds. When summer approaches they seek, for the purpose of depositing their eggs, places covered with aquatic herbage, to which they attach themselves. They are often observed to jump out of the water to seize insects in their flight: their tenacity of life is very remarkable.

They are taken with nets, or with lines baited with worms, and it is easy to people with them marshes, vivaria, muddy dykes, and ponds; but when any of them are introduced into carp-ponds it is necessary that their number should be limited, for their voracity would otherwise starve the carp, and hinder them from growing.

The flesh of the tench is white, but it is soft, insipid, said to be difficult of digestion, and frequently impregnated with an odour of mud and mire.

Passing over, as destitute of popular interest, the intervening sub-genera and genera, we proceed to the family of the ESOCES.

The PIKE, *Esox lucius,* is a well known fish. It is remarkable for the fineness of its hearing, a fact noticed from the time of Pliny. Under Charles IX. of France several individuals of this species, kept in a basin of the Louvre, were accustomed to recognize the voices of those that tended them, and to come regularly to receive their food.

The air-bladder of these fishes is very voluminous, and it allows the pike to traverse great spaces, with the rapidity of lightning, against the currents of the most impetuous rivers, and in the midst of the purest waters, which, consequently, are the least heavy, and the least adapted to support it.

It is not rare to observe among the pikes some individuals blind of one eye, and others which are hermaphrodites.

The flesh of the pike is white, firm, savoury, and easy of digestion. It is never very fat, and is therefore a suitable aliment for convalescents, and persons who have a weak stomach, especially if it be the flesh of a young individual. It varies much according to age, sex, and time of the year, and especially the place where the fish has been taken. The pikes which inhabit limpid waters, where fish in general abound, are better than the others. Those of certain lakes of Germany and Switzerland possess a high reputation. Some old pikes, which are taken in clear streams, have the back green, and the flesh near the vertebral column of the same colour; they are sought after, in preference, and their price is often very high.

It appears that these fishes are not as good in Italy as in

France, for Paulus Jovius and Ausonius seem to think but little of them. The pikes of Châlons were held in high reputation in the thirteenth century: Champier, who wrote in 1560, remarks, that even in his time, as well as in that of Ausonius, the pike was despised at Bourdeaux, but that in the rest of France a very different opinion was entertained concerning it.

Its liver is very good, but its eggs excite nausea, and even violent purging. In some places it is said, indeed, that these eggs are used as a cathartic.

The pike is one of the most voracious and destructive fishes living. "It is," says M. de Lacépède, "the shark of the fresh waters; it reigns there a devastating tyrant, like the shark in the midst of the ocean: insatiable in its appetites, it ravages, with fearful rapidity, the streams, the lakes, and the fish-ponds where it inhabits. Blindly ferocious, it does not spare its species, and even devours its own young; gluttonous without choice, it tears, and swallows with a sort of fury, the remains even of putrified carcasses. This bloodthirsty animal is also one of those to which nature has accorded the longest duration of years; for ages it terrifies, agitates, pursues, destroys, and consumes the feeble inhabitants of the waters which it infests; and as if, spite of its insatiable cruelty, it was meant that it should receive every advantage, it has not only been gifted with strength, with size, with numerous weapons, but it has also been adorned with elegance of form, symmetry of proportions, and variety and richness of colour."

It is in streams, rivers, lakes, and ponds that this formidable fish is to be found; it is never seen but accidentally in the sea, and Rondelet informs us, that such as are taken by chance in the mouth of the Rhine, or in the salt ponds which border the Mediterranean, are dry, and without flavour. But it has been found in almost all the fresh waters of Europe, more especially towards the north. It is more rare in the south. It has even been asserted that there were no pikes in Spain or Portugal, but this is an error, at least as to the former of those countries: it has also been said that there were none in England before 1537, and that it was under the reign of Henry the Eighth that they were introduced into this kingdom, but the truth of this assertion has been called in question. There are some remarkably fine pikes in the lake Thrasymene, in Italy. According to M. Bosc they are found in abundance in all the north of Asia and America; that naturalist caught some in Carolina which he could not possibly distinguish from those of France.

In many districts of France the pike, in consequence of its voracity, is called *poisson-loup*. It devours animals almost as large as itself: it preys with avidity on frogs, serpents, rats, young ducks, and other aquatic birds, and even on dogs and cats which are thrown into the water just after they are born. Rondelet relates, that in the Rhine a pike once seized with its teeth the under lip of a mule that was drinking, and did not let go until the animal had removed to some distance from the water. It has been remarked, however, that notwithstanding its gluttony, it can very well discriminate between the substances that are suitable to it or otherwise. A pike has been observed to receive and swallow some frogs that were thrown to it, but to reject a toad which was afterwards flung into the water. The consumption which it makes of fish is so great that a single aged individual is sufficient to depopulate an entire pond. Accordingly, much care is necessary, at the time of the fishery, not to leave any pikes of large size, and to put in but a small number of young ones, if it be desired that the following fishery shall be productive.

The pike is not only dangerous from its size, the force of its muscles, and the number of its weapons, but also from the extent of its cunning and the resources of its instinct.

When it has darted on an animal of any volume, it seizes it by the head, and retains it in its large gullet, with its sharp and curved teeth, until the anterior portion of this prey is softened, or rather half digested; it then draws in the rest and swallows it, after the manner of the boas. The only fishes in rivers that are dreaded by the pike are the perches and stickle-backs, in consequence of the spines with which their dorsal fins are armed; but it will sometimes even attack the perch, wound it, hold it in an immoveable position, and wait till it succumbs under the loss of blood, to swallow it after it is dead. Albertus Magnus tells us that he was a witness of this fact. As for the stickle-back, it can never serve as food to the pike, for its prickles stand up at the moment of its death, and when a young pike, without experience, and pressed by hunger, ventures to swallow one, it almost constantly loses its life.

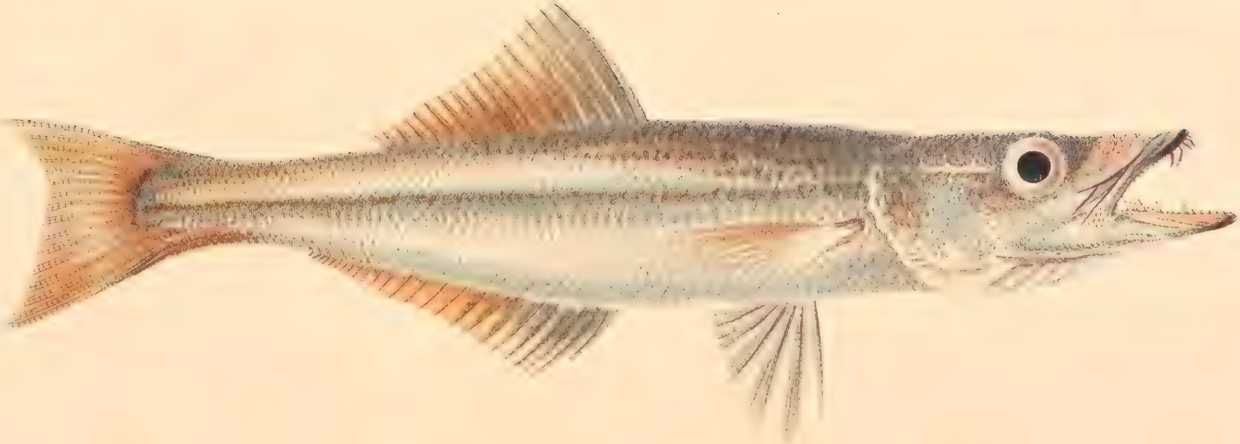
We read in a description of the lake of Zirknitz, in Carniola, by Weichard Valvasor, that that lake supports in great abundance pikes of the weight of ten, twenty, thirty, and forty pounds, in the stomach of which it is usual enough to find entire ducks. Another writer tells us that in the stomachs of certain pikes the spinous fruits of the *trapa natans* have been found, commonly called *water chestnuts:* and, in fine, Johnston assures us that he has seen a large pike, which contained in its belly another large pike, which had in its own belly a water-rat!

The pike may grow to the length of from six to nine feet, and attain to the weight of eighty or one hundred pounds. Those of four or five feet long are not rare in the immense lakes of the north of Europe, and in the great rivers of Northern Asia. Willughby saw one in this country which weighed forty-three pounds; and Dr. Brand, on his estate near Berlin, caught a pike which measured seven feet in length. Bloch examined the skeleton of the head of another individual: this head was ten inches in breadth, which would give to the body a length of eight feet.

But of all the pikes ever known, the most celebrated, and that respecting whose existence no sort of doubt can be raised, was caught in 1497, at Kaiserslautern, near Manheim: it was nearly nineteen feet in length, and weighed three hundred and fifty pounds. It was represented in a painting preserved in the Castle of Lautern, and its skeleton for a long time was kept at Manheim: it bore a ring of gilt brass with this inscription, "I am the first fish thrown into this pond by the hands of the Emperor Frederic II. the 5th of October, 1262." It was therefore at least two hundred and thirty-seven years of age, and must indeed have been more. After this instance of longevity it is almost superfluous to mention another pike, spoken of by Rzaczynsky, which was only ninety years old.

The ancients, moreover, were possessed of positive data on this subject, for Pliny places the pike in the number of the largest fishes, and thinks that it may arrive to the weight of one thousand pounds.

The multiplication of pikes would be immense if the spawn and the young pikes, in the first year of their life, did not become the prey of many species of fish, and even of the larger of their own species, and of most aquatic birds. More than one hundred and forty-eight thousand eggs have been counted in a female of the middle size. The spawning continues during the three months of spring. The young females, that is, those of three years of age, begin, and the most aged finish it. These last are termed in Germany *frog-pikes*, because they deposit their eggs at the same time as the frogs. At this period the pike fishery is forbidden at Strasbourg. Then also those which are in the ponds or lakes try to reascend into the rivers with which they communicate, and all approach the shores to cast their spawn upon the stones, and on plants which are not sufficiently covered by the water to



Esox Lewini ?

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be abstracted from the influence of the sun. At this time the pikes are so much occupied, and so attentive, that they may be caught with the hand.

In their first year the pikes have a green tint; they become grey in the course of the second, with pale spots, which, the following year, present a shade of fine yellow. These spots are irregular, and during the spring season often assume a golden brilliancy, and then the general grey colour is changed into a fine green. In certain waters, in consequence of scarcity, the shades of the pike sometimes vary, and it becomes yellow, with black spots. It is then called the *king of the pikes*, and is much esteemed. According to Schwenckfeld, some pikes are perfectly white.

The pike grows with great rapidity. In its first year it is often eleven or twelve inches long; in the sixth it has been known to measure six feet, and in the twelfth about seven or eight.

If the pikes are a scourge to the inhabitants of the waters which they frequent, they are themselves very often delivered without defence, to internal enemies. On dissection, the tænia are found strongly hooked to the parietes of the intestines. Bloch has reckoned a hundred of these worms in one individual which weighed no more than three pounds.

Our figure of *Esox Lewini*, is from a drawing by Mr. Lewin, made in New Holland, of a species not hitherto noticed.

We shall now briefly notice the EXOCŒTUS, or flying fishes. The name is derived from εξω, *out of*, and κοιτος, *dwelling*, and indicates the faculty which all the species possess of raising themselves into the air. It is singular that Artedi should have confounded them with the blennies.

The common flying fish, *Exocœtus volitans*, is found in almost all warm and temperate latitudes, especially between the tropics; sometimes even it appears in the channel, when the ocean is greatly agitated by tempests. Its manners are the same as those of the *Dactylopterus* already noticed, and it runs the same risk alternately in the water and in the air.

Almost all persons who have travelled by sea have had occasion to observe the fishes of this species rising into the air by thousands at once, and in all possible directions. Their flight carries them fifteen or eighteen feet out of the water. But it is an error to call them *flying-fishes:* they do not in reality fly; they only leap into the air, where they have not the power of sustaining themselves at will. They never come forth from the water, except after a rapid course of swimming. When put alive into a bucket of sea-water, they were only able to rise out of it a few inches. The lines which they traverse, when they enjoy full liberty of motion, are very low curves, and always in the direction of their progress in the water.

The dorades, the squali, and the sea-birds, such as the frigates and the phaetons destroy numbers of these exocœti. They themselves feed on mollusca, and any small fish. Their flesh has an agreeable flavour, and is often used by mariners in long voyages.

The *exocœtus exiliens*, whose flesh is fat and delicate, and which habitually feeds on worms and vegetable substances, is found in the sea of Arabia and in the Mediterranean, especially in the environs of the mouth of the Rhone. It is also found in all parts of the ocean neighbouring to the tropics. It shoots to more considerable distances than the preceding species.

Our observations on the family of the SILURIDÆ must be confined to the SILURUS. The species *glanis* inhabits the fresh waters of Europe, Asia, and Africa. It more particularly inhabits the rivers of Germany and Hungary, where it covers itself in the mud to surprise its prey. It has very rarely been found in the sea, and even then only in the neighbourhood of the mouth of great rivers, from which some fortuitous circumstances appear to have drawn it.

This silurus is the largest of all the fresh-water fishes of Europe, and the only one of the genus found in this quarter of the globe. Six, twelve, and even fifteen feet long, and weighing three, and even four hundred pounds; it has been named the whale of the rivers and lakes by some observers, who were pleased to believe that it domineered and reigned in the fresh-waters like the mighty cetacea in the ocean.

It does not attain its entire developement until after a great number of years, but then swimming, and appearing to move its ponderous mass with difficulty, it excites astonishment, surprise, and terror, by its enormous dimensions. One of these monstrous animals has been seen in Pomerania, whose throat could easily give passage to a child of six or seven years of age. Another was taken at Writzen on the Oder, which weighed four hundred pounds.

It is supported by prey, but it does not pursue its victims. Preferring stratagem to violence, it remains in ambuscade, covers itself with mud, and patiently watches for the fish which are to constitute its sustenance.

It quits the bottom of the rivers only for a month or two, and it is usually towards spring that it appears on the surface of the water, or proceeds to spawn near the shores. The number of its eggs is by no means proportioned to its volume.

The strong spine which forms the first ray of its pectoral fins is so articulated with the shoulder, that it can at will be approximated to the body, or fixed perpendicularly in an immoveable situation, which makes it a dangerous weapon, the wounds of which are generally supposed to be venomous, because they produce locked jaw, when the denticulations of this organ lacerate severely.

Its flesh is white, fat, sweet, and of rather an agreeable flavour. It was attempted to naturalize this fish at Strasbourg, and some were brought from Suabia with that intent. The enterprise was abandoned, though it partially succeeded, for individuals are sometimes received at Paris from Strasbourg, and other towns of the north, tolerably large and in good condition.

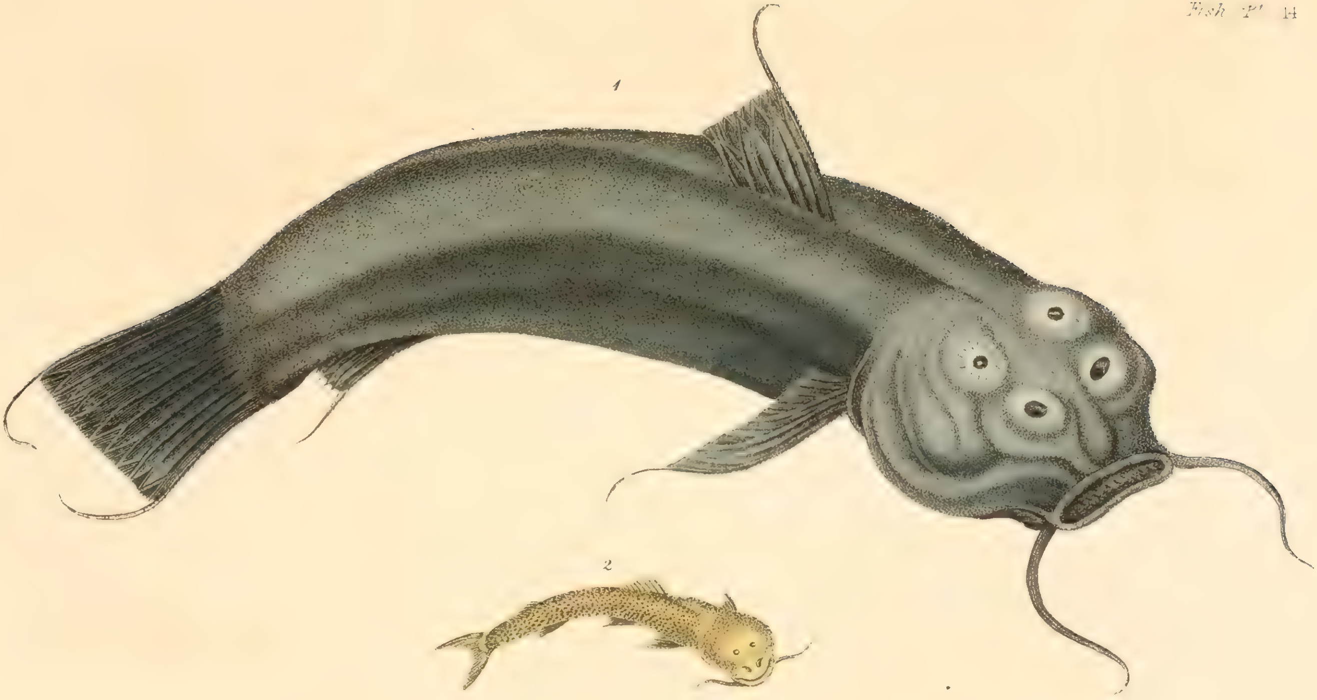
The *Astroblepus grixalvii* of Humboldt, though treated by that naturalist in the zoological part of his travels as the type of a new genus, appears to be a silurus.

We insert a figure of a species of the subgenus Pimelodus, *P. cranchii*, from a specimen in the British Museum. *P. cyclopum* is copied from Humboldt's travels.

In the genus SALMO, as it stood in Artedi, Linnæus, Lacépède, and in most ichthyologists up to the present day, an immense number of fishes were included, which, for the facility of study, are now divided into many subgenera. The SALMON, or TROUT proper, is the type of the family, and our observations upon it will embrace nearly all that can be said respecting the rest of the subgenera.

All the fishes of this genus are carnivorous, and live for the most of their time in fresh water. They seek in general the purest and the quickest streams, those which roll over a sandy bottom, or which fall in cascades in the midst of rocks. They swim with the greatest facility, and struggle with success against the most rapid currents. They possess the faculty of shooting out of the water, and rising by prodigious leaps, either in the air or in the water itself, for the purpose of reascending the cataracts.

The *Salmon*, (*S. salar*), is a fish too well known to need



1. *Astroblepus Grixalvii*. *Humb* 2 *Pimeledus Cyclopum*. *Humb*.

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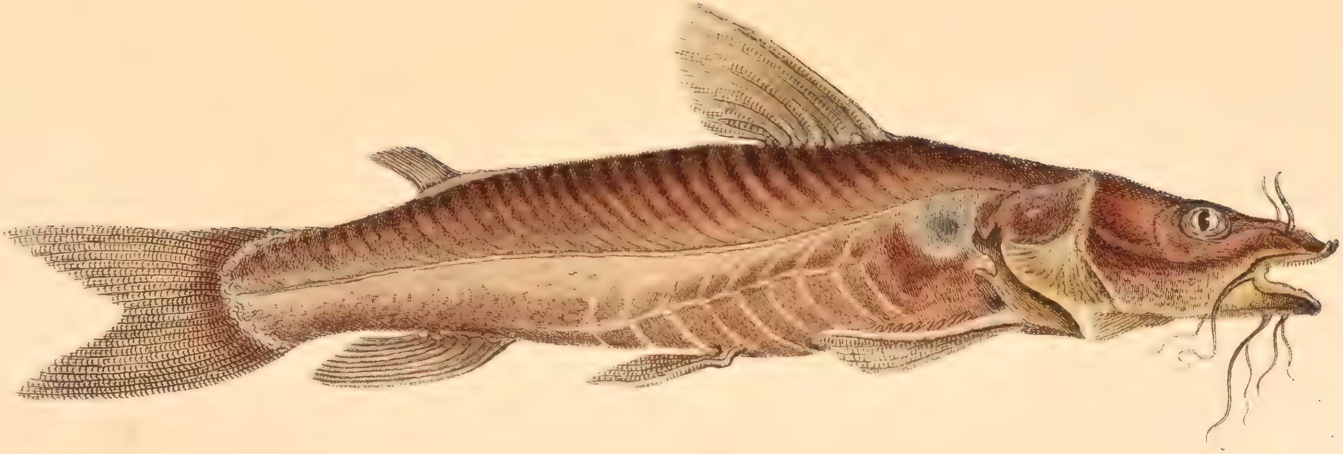

Pimelodus Cranchii

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description. Its flesh is red, and full of fat. It feeds on worms, insects, and small fishes.

It is found in almost all the seas of the north of Europe, Asia, and America. It especially prefers the neighbourhood of great rivers and streams, whose fresh and rapid waters it inhabits for a great portion of the year; it ascends their course for very considerable distances, and sometimes passes from them into the interior lakes.

It does not appear to inhabit the Mediterranean Sea. It was unknown to Aristotle, but has been noticed by Pliny, who merely tells us, however, that it was sometimes taken in the Gallic provinces. It has not been observed in the lake of Geneva.

Its mode of life is truly remarkable. It is born in the fresh water; it grows in the sea; during winter it takes refuge in the ocean; it passes the summer in rivers, and ascends towards their source. It traverses with facility the whole extent of the longest rivers. Through the Elbe it proceeds as far as Bohemia; by the Rhine it arrives in Switzerland; by the Maragnon, whose course is nearly 800 leagues, it attains to the lofty Cordilleras of South America; and through the Loire it gets as far as the environs of Puy, in the ancient Velay. We are also assured that it is neither terrified nor repelled by the vast extent of subterraneous course, and it has been asserted that salmons belonging to the Persian Gulf have been found in the Caspian Sea, and were recognised by the rings of gold, or silver, which the rich inhabitants of the shores of that gulf had attached to them.

In the temperate countries, it is towards the end of winter that the salmons quit the sea, their adopted country. In the more northern regions, they enter into the rivers at the moment when the ice begins to melt on the shores of the ocean, which they annually abandon with the reflux, and are sometimes favoured by a wind, which, in several places, is called the *salmon-wind.*

The sooner a river is freed from ice, the sooner the salmons enter it, and they arrive there in so much the greater number as the wind and tide are stronger. They are, however, almost always impelled by nature to enter those streams in which they have been born. This was very sufficiently proved by an experiment of Deslandes, who bought a dozen salmons from the fishermen of Chanteaulin, placed a ring of brass upon the tails of each, and restored them to liberty. In the following year five, in the second three, and in the third three more of these fishes were retaken. An invisible power traces the route which they have to follow, brings them back exactly to the places of their birth, and all of them reassembled without tumult, appear to follow its guidance with implicit respect; just as we see the swallows every spring return to their nest of the preceding year.

On reascending the rivers, the salmons are united in great numbers, in enormous shoals, in embodied armies, which seem to dart from the bosom of the sea, to invade the empire of the fresh waters. They always proceed in long bands, disposed in two lines, which form the sides of a triangle, the summit of which is occupied by the largest female who leads the van, while the younger or the smaller males constitute the rear-guard. If this order should be interrupted by any cause, it is re-established as soon as possible, and so great sometimes is the multitude of individuals which voyage in this style together, that they are capable of tearing the strongest nets, and thus escaping the hands of the fishers.

These troops in general swim with a great noise, in the middle of the river, and near the surface of the water. They proceed slowly, and sport along the wave, if the temperature of the air be mild, and the radiance of the sun moderate; but when the tempest threatens, or when the sun darts his ardent rays through the burning air, they sink to the bottom.

Violently loud noises, such as the sound of bells, or the discharge of cannon, bodies which float upon the water, particularly if their colours be bright, and their surface shining, terrify these bands, frequently turn them from their direction, and force them to suspend their course or to return to the sea.

They also avoid rivers, the shores of whose mouth are furnished with buildings, and seek those where the banks are shaded with trees.

When a dam, or a cascade, opposes itself to the progress of the salmons, these fishes make the most strenuous efforts to shoot beyond it. Even elevated cataracts are no insurmountable obstacle to them, and they find, in crossing them, an efficacious help in the vigorous muscles which form the mass of their powerful tail. With one of their sides resting upon some large stones, they approximate the extremity of the tail to the mouth, catch it with their teeth, and thus form an arch which constitutes a powerfully tense spring; this they let go with an inconceivable rapidity, strike the water with violence, and spring—as Twiss has observed at Ballyshannon, in Ireland—to a height of twelve or fifteen feet in the air, and then fall beyond the obstacle which had arrested their progress.

If any danger appears to threaten them, if they wish to avoid any snare, the rapidity of their swimming is so great that the eye can scarcely follow them. Experience has proved that in tranquil lakes, they can go eight or ten leagues in an hour, and about twenty-four feet in a second.

This rate of going would give 86,400 feet in an hour, and suppose the faculty of making the tour of the globe in some weeks.

It is impossible for us to scrutinize with effect the mysterious means by which the Creative Power impels the innumerable hordes to their annual and regular emigrations; but we know that towards the end of autumn, exhausted, meagre, and feeble, they redescend to the sea, to seek their ancient and profound retreats, until the returning season again calls them to reproduction.

It is, in fact, the necessity of spawning which impels them to enter the rivers. The females which inhabit these rivers at the period when their ovaries have acquired their full developement, seek out a place convenient for deposition, and rather in the small streams than in the large rivers, choosing, by preference, a current not very rapid, and a bottom of sand and gravel. We are told that in many parts of Scotland, not content with having selected a place suitable for the deposition of their eggs, these provident mothers seek to arrange it in the most favourable manner, by digging an elongated hole from fifteen to eighteen inches long, into which they discharge their burthen, and then cover it with sand with their tail. This fact is also asserted with respect to many other countries, and Dr. Grant, who confirms it in the Memoirs of Stockholm, adds, that in thus preparing the cradle of their posterity, they agitate themselves so much as to wear their ventral fins, and rub themselves so strongly against the ground, that they detach small stones from it with violence.

When the eggs have been abandoned by the female, the male comes to fecundate them, an operation which takes place generally in the night, or during thick and foggy weather; after this the eggs are developed more or less quickly, according to the temperature of the climate, the heat of the season, and other external circumstances. Their number too is very great, 27,850 have been counted in one female of the weight of twenty pounds.

The young salmons grow rapidly, and very soon come to the length of four or five inches. When they have attained nearly to a foot in length, they have sufficient strength to abandon the upper part of the rivers, and to gain the sea, which they quit again when they are eighteen inches long, towards the commencement of summer, and later than the old individuals of their species. At two years of age, they weigh six or eight pounds, and at five or six years old, they only weigh ten or twelve. From these data, we may easily judge of the advanced age of those which are fished in Scotland and in Sweden, of six feet long, and not weighing less than eighty or one hundred pounds.

Such is the abundance of these fishes, that at Bergen, for instance, it is by no means extraordinary to see the fishermen bring in two thousand salmons in a day. We read, in the account of the voyage of Lapeyrouse, that on the Eastern coast of Tartary, a similar number of these fishes was taken in one day in the month of July, and there are countries where more than 200,000 are taken in the year. Pennant tells us that in Norway a single cast of the net sometimes furnishes more than three hundred, and in the Tweed it brings more than seven hundred.

The salmons possess no great tenacity of life. They die promptly, not only when they are taken out of the water, but even when they are shut up in reservoirs, the water of which is not running, or in hutches or troughs, which are not placed in the middle of rivers.

With respect to the other species, the trout, the salmon-trout, &c., there is nothing of importance for us to add here.

Our figure of *Salmo Canadensis* was drawn by Colonel Hamilton Smith, from a living specimen taken in Canada: it is beautifully dotted with blood-red in a white circular spot.

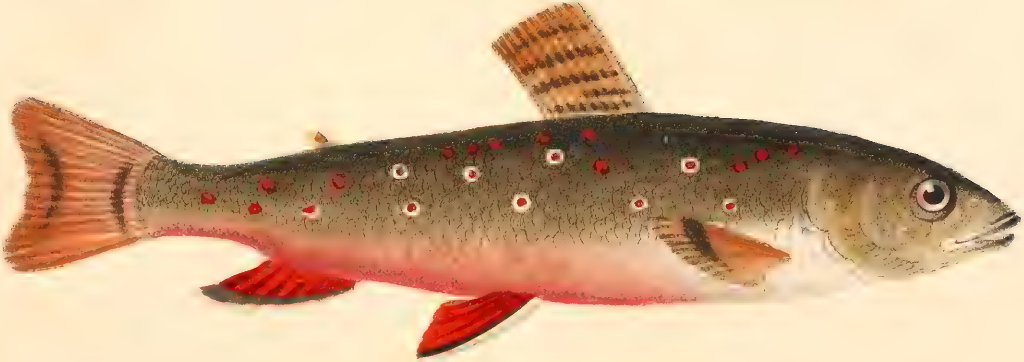
The subgenus OSMERUS contains but one species, *salmo-eperlanus*, Lin., the well known fish called the *smelt*. This fish emits an odour which some have compared to that of the violet. It inhabits the sea, the mouths of great rivers, and the depths of lakes where the bottom is sandy. Towards spring it ascends into the rivers in numerous troops to deposit or fecundate its eggs, and multiplies astonishingly. In some of our markets, smelts are extremely plentiful, as they likewise are in Germany and Sweden. They are taken with nets with very close meshes. The smelt lives on worms and small testacea.

Bloch supposes that the sea-smelt is different from that of the lakes; but he is unable to establish any foundation for the difference. There is found, however, in the depths of the the Baltic Sea, in the North Atlantic, and about the Straits of Magellam, a variety which differs from the smelt of the lakes, by its weaker odour, and larger dimensions.

We have come to the great genus CLUPEA, (*the herrings*), one of the best known and most useful to the human race.

The *Clupea harengus*, or well-known *herring*, swims with considerable strength and agility, and feeds on the eggs of fishes, small crabs, and worms.

On the shores of Norway the herrings, according to the report of some travellers, feed principally on a sort of reddish worms, which the inhabitants name *roë-acal*, or *aat*, or *silaat;* but these animals are not worms, they belong to the class of crustacea. Fabricius has described them under the name of *astacus harengum*. It is probable that they belong to the *mysis* of Latreille and Leach. They are so multiplied in summer that in drawing up a little sea-water



Salmo Canadensis. Hamilton Smith

thousands of them will be brought up along with it. The herrings follow them wherever they are driven by the wind and current, and this sort of aliment communicates to their belly and to their excrements a red tint, which appears owing, according to M. Strœm, to a humour contained in the eyes of these crustacea. Many persons have also attributed to the herrings which feed upon them certain deleterious properties, and regard them as one of the causes of some diseases which afflict the inhabitants of the North. But this is probably an error. We are assured, however, that putrefaction very speedily occurs in those herrings which have been taken at the moment when their intestines were filled with these animals.

Each year, in summer and autumn, these celebrated fishes proceed from the North, and arrive on the western coasts of Europe in innumerable legions, or rather in crowded shoals of an immense extent. They also spread themselves over certain shores of America, and on the northern coasts of Asia. It is generally believed, and the idea has been remarkably accredited by Anderson, that they withdraw at certain periods into the regions of the Polar Circle, to seek an asylum under the ice of the northern seas, and that not finding food there in proportion to their prodigious numbers, they send forth colonies, in the commencement of every spring, towards more southern shores. Some naturalists have gone so far as to trace the route which those migrations follow, and represent them as divided into two troops, innumerable detachments from which cover the surface of the seas to a considerable distance. One of these great columns, according to them, crowds round the coasts of Iceland, and spreading beyond Newfoundland, proceeds to fill the gulfs and bays of the American continent; the other descends along Norway, and sends a detachment into the Baltic, while the remainder, making the tour of the Orcades, advances between Scotland and Ireland, coasts towards the south of this latter island, extends to the east of Great Britain, and proceeds as far as Spain, traversing the coasts of Germany, Batavia, and France.

Recent naturalists, however, have utterly denied the truth of these marvellous emigrations, resting upon the simple fact, that many years often elapse without any herrings being seen near the shores indicated as the most remarkable in the route of these fishes; and also, that in many other pretended stations plenty of these fish is taken all the year round; that their bulk often varies, according to the quality of the waters which they frequent, without any relation with the season, with their remoteness from the northern regions, or with the length of space which they may have had to traverse; and finally, that no certain sign has ever indicated their regular re-entrance under the ice of the high latitudes.

It is not known, in fact, what becomes of them. Their shoals have never been observed pursuing the homeward route. Why is it, moreover, that the smallest kind of herrings turn towards the direction of the Baltic, and the largest towards the North Sea? If, as has been asserted, it is their dread of the whales which causes them to emigrate, how is it that they proceed many hundreds of miles beyond the latitudes which these cetacea usually inhabit? Wherefore are they again to be found in the very same places from which they fled but a few months before? and why do they issue forth from the Baltic, where they have nothing to fear from these redoubtable enemies? Why, if they are driven by the want of aliment from the ices of the north, do they always arrive at the same period of the year? Finally, how is it that we scarcely ever see the small herrings, which ought to accompany the large ones, if they were acted upon by general causes?

Other observers tell us that the herrings, usually buried in the depths of the sea, approach the surface from the necessity of seeking fresh food, and especially to get rid of their eggs and milt. Thus, either in spring or in summer, they approach the mouths of rivers and shores convenient for spawning. Accordingly, the fishery is much more abundant than when the milt is liquid and the eggs ready to escape. It is also possible that the spawning may take place more than once in the year; its period, at least, is advanced or retarded according to the age of the herrings and the climate in which they live. It is in consequence of this that in certain tracts these fish are to be taken for nearly three seasons, both full and empty. Thus in some parts of the Baltic the *spring-herrings* spawn when the ice begins to melt, and continue to be seen until the end of the season, the name of which they bear. Then come the larger, or *summer-herrings,* which are again followed by others, named *autumn-herrings.*

These fishes appear to live in the depths of the sea which extends from the forty-fifth degree of latitude as far as the Arctic Pole.

But, at whatever period the herrings abandon their winter sojourn, they proceed in troops, which are preceded by some isolated males, often some days in advance, and in which there are commonly more males than females. When the spawning commences they rub their belly against the rocks or the sand, agitate themselves, make rapid motions with their fins, place themselves sometimes on one side sometimes on another, imbibing and rejecting the water with force and vivacity.

We have no very precise notions respecting the time in which the spawn of the herring discloses the young, nor as to the period which is necessary for this species of fish to attain its maximum of size. Its usual length is about ten inches.

It multiplies astonishingly; sixty-eight thousand six hundred and six eggs have been reckoned in a single female: accordingly the herrings do not appear to diminish in number, notwithstanding all the causes of destruction which are arrayed against them.

In their courses, the innumerable legions of herrings cover an immense extent of the surface of the seas, and yet, however, proceed in perfect order: the largest, the strongest, or the boldest, lead the van. Thousands of them are snatched from their long and crowded ranks to supply food to the cetacea, the squali, the other large fishes, and the sea-birds. A great number still perish in the bays, into which they precipitate themselves, crowd, and accumulate mutually against the shallows and the shores, until they are suffocated or crushed: numbers likewise fall into the net of the fisherman. In some inconsiderable creek on the Norwegian coast more than twenty millions of herrings have been the product of a single fishery. There are few years in which more than four hundred millions are not taken in that country. Bloch has calculated that the inhabitants of the neighbourhood of Gothemburg, in Sweden, take annually more than seven hundred millions of these fishes, and yet, nevertheless, this bears no comparison to what are taken by the fishermen of Holstein, of Mecklenburg, of Pomerania, of France, of Ireland, Scotland, and England, of the United States, of Kamtschatka, and above all, of Holland, where, instead of awaiting their arrival on the coasts, the fishermen proceed to meet them in the open sea in large fleets. They thus often proceed northwards as far as the Shetland Islands.

We find nothing in the writings of the Greeks and Romans which appears to indicate that these nations were acquainted with the herring. The fishes of the Mediterranean must in fact have been nearly the only species of the class which they could observe or procure with facility, and the herrings are not among the number of those. This fish, therefore, is neither the *halec* or *hælex*, nor the *mænis*, nor the *bucomænis*, nor the *gerris* of Pliny. The *μαινὶς* of Aristotle, named *alec* by Gaza, and the *mæna* of Pliny belong to the *menides* of the "Animal Kingdom." The herring appears to have been an article of food in France as far back as the thirteenth century.

The *Clupea alosa* (shad) is a much larger fish than the herring, attaining nearly three feet in length, but as it is very thin its weight is seldom more than four pounds.

The shads inhabit the North Atlantic, the Mediterranean, and Caspian Seas. In spring they ascend into the great rivers, such as the Volga, the Elbe, the Rhine, the Seine, the Loire, the Garonne, &c., forming numerous troops, which sometimes advance to the sources of these rivers. Their numbers vary much from one year to another. Thus in the lower Seine thirteen or fourteen thousand shads are taken in certain years, and in others not more than from five hundred to two thousand.

When they try to escape they agitate themselves violently, and make a noise which may be heard at a considerable distance. They live on worms, insects, and small fishes.

It is asserted that they are terrified by thunder, and violent noises in general; nevertheless, fishermen, and more especially those of the Mediterranean, are persuaded that they are fond of music, and accordingly they employ musical instruments when they go in search of these fish: in certain rivers they attach small bells to their boats. This prejudice, in all probability, saves numbers of the shads. Rondelet, however, tells us that he saw some of them come to the sound of the lute, and leap and swim towards the surface of the water. The Loire is the river of France in which they most abound, and the most favourable season for the fishery is from the end of March to that of May.

They have a habit of following boats which are laden with salt, which causes them to be sometimes taken even at Paris. They also generally endeavour to vanquish any obstacles which oppose their progress, in consequence of which many of them are caught at the bottom of the dams of rivers, &c.

Ausonius tells us, that in his time the shad was regarded by the Bordelais as an aliment fit only for the lowest of the people.

This is a remarkable example of the changes of opinion in matters of taste; at the present day it is served up on the best tables.

The flesh of the shad, when fresh, is very delicate, and much esteemed. The Russians, however, imagine that it possesses some deleterious qualities, and in this persuasion they throw the shads out of their nets, or sell them at a trifling price to the Tartars, who are less prudent, or less difficult to please. In many countries they are fished in great abundance and smoke-dried. The Arabs dry them in the air, and eat them with dates.

C. pilchardus (the pilchard) is about the size of the herring, and is caught more particularly on the coast of Cornwall, where it arrives in large troops towards the end of July, disappears in autumn, and shows itself again in the beginning of January. Severe cold sometimes retards the return of the pilchards, and storms turn them from their course; their arrival is carefully looked for by the fishermen, and indicated, at some distance, by the concourse of sea-birds, by the phosphoric light emitted by these fishes, and by the odour which is exhaled from their milt.

The pilchards form an useful and important article of commerce. Their flesh is fat and well-flavoured, and affords a considerable quantity of oil.

On the rest of the subdivisions of this family our limits will not permit us to add anything to the text; and, indeed, there is little that could be added of any importance. We therefore close our remarks upon the order.

THE

THIRD ORDER OF FISHES.

MALACOPTERYGII SUBBRACHIATI,

Is characterized by ventrals attached under the pectorals, and the pelvis is immediately suspended to the bones of the shoulder.

It contains almost as many families as genera.

The first, or that of

GADOIDES,

Is composed almost entirely of the great genus

GADUS[1], *L.*,

To be recognized by the ventrals attached under the throat, and sharpened to a point.

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[1] *Gadus* is, in Athenæus, the Greek name of a fish, otherwise called *Onos*. Artedi has applied it to this genus for the purpose of avoiding those of *Onos*, *Asellus*, and *Mustela*, employed by the ancients, and which the first modern ichthyologists believed, though without any proof, to have designated some of our Gadi, but which being also the names of quadrupeds, might have produced some ambiguity. *Gadus*, moreover, resembles the English name of these fishes, *cod*.

Their body is moderately elongated, but little compressed, covered with soft scales not very voluminous; their head is well proportioned, and without scales; all their fins are soft; their jaws, and the front of the vomer, are armed with pointed, irregular teeth, middling, or small-sized, in several ranks, forming a sort of currycomb, or rasp; their gills are large, with seven rays. Almost all have two or three fins on the back, one or two behind the anus, and a distinct caudal. Their stomach is in the form of a large and strong sac; their cœca are very numerous, and their caudal tolerably long. They have a large air-bladder, with strong parietes, and frequently dentated in the sides.

These fishes, for the most part, live in cold or temperate seas, and constitute most important resources in their fishery. Their white flesh, easily dividing into flakes, is generally wholesome, light and agreeable.

The Gadi may be subdivided as follows:

MORRHUA,

With three dorsal fins, two anal; a barbel at the end of the lower jaw: they are the most numerous of this division.

Gadus morrhua, L., Bloch 64, (the cod). Two and three feet in length, with the back spotted with yellowish or brown, inhabits the whole northern sea, and multiplies to such a degree in the northern latitudes, that entire fleets repair thither every year, to catch, salt, and dry it, for the supply of Europe and the colonies. In France the fresh cod is named *cabeliau*, from the Dutch name of this fish [1].

Gadus Æglefinus, L., Bl. 62. (the haddock). Brown back, silvery belly, lateral line black ; a blackish patch behind the pectoral ; as abundant as the cod in the northern latitudes, but of a less agreeable flavour. When it is salted, *we* name it *hadou*, after the English name *haddock* [2].

Gadus callarias, L., Bl. 63 ; in Paris *Faux merlan* [3]. Spotted like the cod, but usually much smaller, and have the upper jaw longer than the other. This is the most agreeable species to eat when fresh. It is especially in request on the coasts of the Baltic Sea [4].

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[1] Belon believes that the word *Morrhue*, (Fr. *Morue*), comes from *Merwel*, a name which he calls English, but which I do not find in any modern authors of that nation : they all name it *cod*, or *cod-fish*.

[2] *Egrefin*, or rather *Eaglefin*, was formerly its English name, according to Belon and Rondelet. It is the *Schelfisch* of Anderson, and the Germans, Dutch, Danes, &c.

[3] *Dorsch* is the name of this fish upon the coasts of the Baltic sea. *Callarias galarias*, &c., were ancient names badly determined, but which certainly could not be applicable to any fish, a stranger to the Mediterranean.

[4] Add the *Tomcod*, (*G. tomcodus*, Mitch.); the *Tacaud*, *Gode mollet*, or *petite morue fraiche*, (*G. Barbatus*, Bl. 166); the *Capelan*, or *Officier*, (*G. minutus*, Bl. 67. 1.); the *Wachnia*, *G. macrocephalus*, Tiles. Ac. de Petersb. II. pl. xvi. ; *Gadus gracilis*, Id. ib. pl. xviii. ; the *Saida*, (*Gad. Saida*, Lepechin, Nov. Com. Petrop. XVIII. pl. v. f. 1. copied Encycl. f. 360 ;) the *Bib*. (*Gad. luscus*, Penn. copied Encyc. 102.) ; *Gad. blennoïdes*, Penn. copied Encycl. 363.

MERLANGUS,

Have the same number of fins as the cods, but are destitute of barbels.

Gadus merlangus, Lin., Bloch 65. (the whiting). A fish well known along the coasts of the ocean, in consequence of its abundance and the lightness of its flesh. It is distinguished by its size of about a foot long, by its pale reddish grey back, by its silvery belly, and its long upper jaw.

Gadus carbonarius, L., Bl. 66. (the coal-fish). Grows to double the size of the whiting; is of a deep brown, and has a shorter upper jaw, and the lateral line straight. The flesh of the adult is coriaceous. It is salted and dried like the cod [1].

G. pollachius, L., Bl. 68. (the pollock). Has the same sort of jaws, and almost the same size as the preceding; is brown above, silvery underneath, and has the flanks spotted. It is a better fish than the last, and yields only to the whiting and the callarias. All these fishes live in large shoals in the Atlantic Ocean [2].

MERLUCCIUS,

Which have but two dorsal fins and an anal, and are without barbels, like the whiting.

Gadus merluccius, L., Bl. 164. (the hake). From one to two feet in length, and sometimes much more; the back brownish grey, the anterior dorsal pointed, and the lower jaw longer. It is taken in equal abundance in the Ocean and the Mediterranean, where the Provençals give it the name of *merlan* (whiting). Salted and dried in the north, it receives the name of *stockfisch*, which is equally applied to the dried cod[1].

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[1] Its usual French name *Colin*, whence comes its northern names *Kohl-fisch*, Coal-fish, &c.

[2] Add the *Sey*, *Gadus virens*, Ascan.

Lota, *Cuv.*,

Unite with two dorsals and one anal, barbels more or less numerous.

Gadus molua, L., Bl. 69. (the ling). Three or four feet long; rather olive above, silvery underneath; the two dorsals of equal height; the lower jaw a little shorter, having a single barbel[2].

This fish, equally abundant as the cod, is preserved with equal facility, and forms an almost equally important article of fishery[3].

Gadus lota, Bl. 70. One or two feet long; yellow, marbled with brown; a single barbel at the chin; the two fins of equal height. It is the only fish of this genus which ascends far into the fresh waters. Its head a little depressed, and its body almost cylindrical, give it a peculiar aspect. Its flesh is very much esteemed, and particularly the liver, which is singularly voluminous[1].

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[1] Add *Gad. magellanicus*, Forst. Ap. Bl., Schn. p. 10; *Gad. maraldi*, Risso. first edition, fig. 13.

[2] *Længa*, *Længe*, *Ling*, names of this fish in divers countries in the north. *Molua*, a corruption of *Morrhua*, applied to this species by Charleton.

[3] Add *Gadus bacchus*, Forst. Ap. Bl., Schn. p. 53; *Lota elongata*, Risso, 2d. ed. f. 47.

We may yet again distinguish among the lotæ,

MOTELLA, *Cuv.*,

Whose anterior dorsal is so little elevated as to be scarcely perceptible.

Gadus mustela, Linn., Bl. 165, under the name of *G. tricirrhatus.* Fulvous brown, with blackish spots; two barbels to the upper jaw, one to the lower[2].

BROSMIUS, *Cuv.*,

Have no first separate dorsal, but a single and long fin, which extends to very near the tail.

No species are known except from the north. The most common species, *G. Brosme,* Gm., Pen., Brit. Zool. pl. xxxiv. descends no lower than the Orkneys. It appears that there is in Iceland a still larger species. *G. lub.* Nouv. Mém. de Stockh. XV. pl. viii.[3]

All these fishes are salted and dried.

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[1] Add *Gadus maculosus*, Lesueur, Ac. Sc. Nat. Philad. i. p. 83.

[2] Add to the Motellæ, *Gadus cimbricus*, Sch. pl. ix.; or *G. quinquecirrhatus*, Penn. Brit. Zool. pl. xxxiii., erroneously named *mustela*, by Bloch and Gmelin. Compare also, the *Mustela maculata*, and *fusca*, Riss. 2d. ed. p. 215; and the *Blennius lupus*, and *labrus*, Rafinesque, Caratt. pl. iii. f. 2 and 3.

[3] In many districts also the people give to the *Brosmii* the names of *Ling* and *Dorches*, Sc. Penn. loc. cit. and Olafsen. Voy. en Isl. trad. Fr. pl. xxvii. and xxviii.

Finally, in

Brotula, *Cuv.*,

The dorsal and anal are united with the caudal into a single fin, terminating in a point.

But a single species is known, belonging to the Antilles, with six barbels, *Enchelyopus barbatus*, Bl., Schn., Parra, pl. xxxi. f. 2.[1]

Phycis[2], *Artedi* and *Schn.*,

Differ from the other Gadi only by having ventrals with a single ray, often forked. Their head, besides, is thick; there is a barbel on the chin, and two fins on the back, the second of which is long. There are some species in our seas.

The most common in the Mediterranean is that named *Molle*, or *Sea-tench*, (*Phycis Mediterraneus*, Laroche, *Phycis tinca*, Schn., *Blennius phycis*, Linn.) Salvian. fol. 230. Its anterior dorsal is round, and not more raised than the other; its ventrals are pretty nearly the length of its head.

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[1] My four subdivisions of *Lota*, *Motella*, *Brosmius*, and *Brotula*, are united by Schneider in the genus *Enchelyopus*. This name, formed originally by Klein for all sorts of elongated fishes, signifies *Anguilliform*, or shaped like an eel. Gronovius confined it to the *Blennius viviparus*, which is my genus *Zoarcus*.

[2] *Phycis*, the ancient name of a gobius. Rondelet has applied it to our first species of which Artedi had made a genus, united to the blennies by Linnæus, and re-established by Bloch, Ed. de Schn. p. 56.

Another, which is also taken in the ocean, is *Merluccius barbatus,* Duham, II. pl. xxv. f. 4. *Phycis blennoïdes,* Schn.; *Gadus albidus,* Gm.; *Blennius gadoïdes,* Risso.; *Gadus furcatus,* Penn., &c. The first dorsal more raised; and its first ray very much elongated. The ventrals twice as long as the head[1].

RANICEPS,

Have the head more depressed than phycis and all the other gadi; and the anterior dorsal so small that it is lost, as it were, in the thickness of the skin.

As yet we have none except from the ocean[2].

We cannot approximate the following genus to any but the Gadi.

MACROURUS, *Bloch.* LEPIDOLEPRUS, *Risso.*

Their suborbitals unite together in front, and with the nasal bones, to form a depressed muzzle, which advances beyond the mouth, and under which the latter preserves its mobility. The entire head and the whole body are furnished with hard scales, bristling with small spines. The ventrals are small, and a little jugular; the pectorals moderate. The first dorsal is short and elevated; the second dorsal and the anal are both very long, and unite in a point at the caudal; the jaws have only very fine and very short teeth. These fishes live at very great depths, and utter a sound like the growlers, when they are taken out of the water.

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[1] I have given the above characters, having had both the fishes under my inspection. The *Batrachoïdes Gmelini,* Risso, first ed. f. 16, does not differ from our first species.

Add *Enchelyopus Americanus,* Schn., or *Blennius* chubs, Nat. de Berlin, vii. 143; or *Gadus longipes,* Mitch. I. 4.

N.B. The fig. of Schn. pl. vi. is erroneously referred to *Phycis tinca,* as has been well observed by M. de la Roche, Ann. du Mus. xiii. p. 333.; it is rather that of *G. longipes.*

[2] *Gadus raninus,* Mull. Zool. Dan. pl. xlv. *Blennius raninus,* Gmel.; *Batrachoïdes blennioïdes,* Lacép.; *Phycis ranina,* Bl., Schn. 57. *Gadus trifurcatus,* Penn. Brit. Zool. III. pl. xxxii.; *Phycis fusca,* Schn.

But two species are known, inhabiting the deep parts of our seas, *Lepidol. cælorhyncus,* and *trachyrhyncus,* Risso, first edition, pl. vii. f. 21. and 22 [1].

The second family of the MALACOPTERYGII SUBBRACHIATI, vulgarly called

FLAT-FISHES,

Comprehends the great genus

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[1] N.B. We are assured, from a direct comparison, that the *Lepidoleprus cælorhyncus* of the Mediterranean, Risso, first ed. pl. vii. f. 22, differs in nothing from the *Macrourus rupestris,* Bl. 177; or *Coryphæna rupestris,* Gmelin, Gunner, Mém de Dronth, III. pl. iii. f. 1. The *Lepidoleprus trachyrhyncus,* Riss. ib. f. 21. is the same fish as the *Oxycephas scabrus,* Rafinesque, Index, pl. i. f. 2. The same species, or a very kindred one, of Japan, is in the Atlas of the Voy. of Krusenstern, pl. lx. f. 8. and 9. Giorna had already given incomplete figures of the two species, Mém de l'Ac. de Turin. Vol. IX. pl. i. The *Lep. trachyr.* is also the *mysticetus* of Aldrovandus, Pisc. p. 342.

Pleuronectes[1], *L.*

They have a character which is unique among vertebrated animals, that is the want of symmetry in the head; both eyes being on the same side, which remains uppermost when the animal swims, and is always strongly coloured, while the side in which the eyes are wanting is invariably whitish. The rest of the body, though in general disposed in the ordinary way, participates a little in this irregularity; thus the two sides of the mouth are not equal, and it is but seldom that the two pectorals are so. Their body is very much compressed, and elevated vertically. The dorsal runs along the whole of the back; the anal occupies the under part of the body; and the ventrals have almost the appearance of continuing it forward, inasmuch as they are often united one to the other. There are six rays to the gills. The abdominal cavity is small, but is prolonged into a sinus, in the thickness of the two sides of the tail, to lodge some portion of the viscera. There is no natatory bladder; and these fishes seldom quit the bottom. The skeleton of their cranium is curious, in consequence of this inversion, which brings the two orbits on one and the same side. Nevertheless, we find in it all the pieces common to the other genera, but unequal.

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[1] *Pleuronectes*, is a name composed by Artedi, from πλευρὰ, the side, and νηκτὴς, a swimmer; because they swim upon the side. The ancients gave them different names, according to the species, such as *Passer*, *Rhombus*, *Buglossa*, &c.

The pleuronectes furnish, along the sea-coasts in almost all countries, an agreeable and wholesome nutriment.

Individuals are sometimes found which have the eyes placed on a different side from that in which they are seated in the rest of their species. These individuals are named reversed *(contournés)*; others, in which the two sides of the body are equally coloured, are named *double*. It is most frequently the brown side which is thus repeated, but sometimes it is the white also[1].

We divide them as follows :

PLATESSA, *Cuv.*,

Have to each jaw a range of trenchant obtuse teeth, and most frequently to the pharyngeals, some teeth *en pavé*. Their dorsal advances just above the upper eye, and leaves, as well as the anal, a naked interval between it and the caudal. Their form is rhomboidal; the majority have the eyes on the right side. They have two or three small cœca. Our seas possess some, such as *Pleur. platessa*, L., Bl. 42. (*the plaice, carrelet*, Fr.[2])

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[1] The *rose-coloured flounder*, Shaw, IV. ii. pl. xliii. is a *flounder* in which the white side is double.

[2] N.B. The name of *Carrelet*, or *petit carreau*, has been applied by some authors to the barbel, but contrary to the usage of our coasts and markets. The true *carrelet* is a young plaice.

It is recognized by six or seven tubercles forming a line on the right side of its head, between the eyes, and by spots of an aurora-colour, which relieve the brown of the body on this same side; it is three times as long as it is high. The flesh of this species is the tenderest of any of this subgenus[1].

Pl. latus, C., (the broad plaice). Has the same tubercles as the foregoing, but its body is but once and a half as long as it is high. It is very seldom caught on our coasts.

Pleur. flesus, (the flounder), L., Bl. 44. and 50., under the name of *Pl. passer*[2]. Has pretty nearly the same form as the plaice, with paler spots; it has only small grains at the salient line of the head, and all along its dorsal and anal is a small rough button on the base of each ray; its lateral line has also bristling scales. Its flesh is much inferior to that of the plaice. It ascends very high into the rivers, and many individuals in this species are reversed.

Pl. pola, Cuv., Duham. Sect. IX. pl. vi. f. 3. and 4., under the name of *Vraie Limandelle*. Is of oblong form, and approaching to that of the sole, although broader, and is distinguished from the other platessæ with trenchant teeth, by a smaller head and mouth. Its body is smooth and its lateral line straight. It is esteemed here as equal to the sole.

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[1] It appears that there is in the north a very large *plaice*, which differs in some respects from this on our coasts, and particularly because the spine behind the anus remains concealed under the skin. (*Pl. borealis*, Faber. Isis. tome xxi. p. 868.)

[2] The *Pl. passer* of Artedi and Linnæus is not different from the turbot; that of Bloch is only an old *flesus*, turned to the left.

Pl. Limanda, Linn., Bl. 46., (the bret). Is of a rhomboidal form, like the flounder, and has tolerably large eyes, and between them a salient line. Its lateral line undergoes a strong curve above the pectoral. Its scales are more rough than in the preceding species, which has given rise to its French name *limande,* from *lima,* a file ; its teeth, though in a single range, as in the other plaices, are less broad, and almost linear. The side on which the eyes are is a clear brown, with some nearly effaced spots, brown and whitish. Although small, it is more esteemed at Paris than the plaice, because it bears the carriage better [1].

HIPPOGLOSSUS, *Cuv.*,

Have, with the fins and form of platessa, the jaws and pharynx armed with teeth, most generally strong and sharp. Their form is usually more oblong.

The North Sea produces one which grows to an enormous size, arriving, it is said, to six or seven feet in length, and three or four hundred pounds weight. It is

Pl. hippoglossus, L., Bl. 47., (the great halibut). It has the eyes to the right, the lateral line arched above the pectoral. It is dried, salted, and sold in pieces throughout all the North[1].

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[1] Add *Pleur. planus,* Mitchill ; *Pleur. stellatus,* Pall. Mém. de l'Ac. de Pétersb. III. x. 1.

In the Mediterranean are smaller ones, some of which have the eyes to the left.

One among them, *Pl. macrolepidotus*, Bl. 190., or *Citharus*, Rondel. 314., is distinguished by larger scales in proportion than any other. It is oblong, and has a straight lateral line.

Rhombus, *Cuv.*,

Have to the jaws and pharynx, like hippoglossus, some close or even teeth, or pectiniform; but their dorsal advances towards the edge of the upper jaw, and extends, as well as the anal, almost nearly to the caudal. The majority have the eyes to the left.

In some these eyes are approximated, and in their interval is a crest slightly salient. Such are the two large species of our coasts, the most esteemed of all the genus Pleuronectes.

Pl. maximus, L., Bl. 49. (the turbot). Rhomboidal body; almost as high as long; bristled on the brown side with small tubercles. And

Pl. rhombus, L., Bl. 43. (the brill). The body more oval, without tubercles, and distinguished besides by the first rays of its dorsal being half free, and their extremity being divided into several strips.

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[1] The *Pl. limanoïdes*, Bl. 186., or *Citharus asper*, Rondel. 315., and *pinguis*, Faber, Isis. tome xxi. p. 870. also appear to be hippoglossi of the North. Add *Pleur. erumei*, Bl., Schn., or *adalah*, Russel i. 69.; *Pl. nalaka*, Cuv., or *Norée nalaka*, Russel 77.

Pl. punctatus, Bl. 189., *Pl. lævis*, Shaw, *Pl. hirtus*, Zool. Dan. pl. ciii. *Kitt* of the English, Penn. pl. xli., Ray, Synon. pl. i. f. 1., Duham. Sect. ix. pl. v. f. 4. is much more rare on our coasts. Oval, like the brill: it has no stripes to its rays; its scales are rough, its teeth very fine, its cheek furnished with very close and even teeth, and it has spots and black points on a brown ground[1].

Pl. cardina, Cuv., Duham. Sect. ix. pl. vi. f. 5. and Ray. 170. pl. i. No. 2., *Whiff* of the English[2]. Is altogether oblong; its first rays are free, but simple; its teeth very close and even. It has spots partly white and partly blackish thrown upon a brown ground. It is also taken on our coasts of the channel, but rarely.

In the Mediterranean is a species some inches long, whose large and thin scales fall very easily, *Pl. nudus*, Risso, *Arnoglossum*, Rondelet 324.

And another still smaller, quite transparent, with a series of red spots, wide apart, on the dorsal and anal, *Rh. candidissimus*, Risso, 2nd edit. f. 34., or *Pleur. diaphanus*, Schn. iv. 2nd part, 309.

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[1] I have reason to believe that the *Pl. unimaculatus*, Risso, 2nd edit. f. 35., is a sexual variety of the *Pl. punctatus*.

[2] These figures, not having been engraven from a mirror, represent the eyes to the right, whereas they are to the left. Bloch, by some unaccountable inattention, believed that the *Whiff* of Ray and Pennant was the *targeur* (*Pl. punctatus*), whereas this last is the *kitt* of those authors. It is sufficient to glance at plate i. of Ray, where they are both represented, to be convinced of this. Add *Pl. triocellatus*, Schn., Russel 76.; *Pl. maculosus*, Cuv., Russel 75; *Pl. aquosus*, Mitch. pl. ii. f. 3.; *Pl. Boscii*, Riss. 1st edit. pl. viii. f. 33.; *Pl. aramaca*, Cuv., Marcg. 181., very different from *Pl. macrolepidotus*, which is not from Brazil, but the Mediterranean, and with which Bloch has confounded it.

In other turbots the eyes are very much separated, and the upper one far back; their interval is concave; they have a small salient hook on the base of the maxillary, at the side where the eyes are, and sometimes another on the inferior eye. The Mediterranean produces some of this sort[1].

SOLEA, *Cuv.*,

Have, as a peculiar character, the mouth turned, and, as it were, distorted to the side opposite to the eyes, and furnished on that side only with very fine and crowded teeth, while the side on which the eyes are have none. Their form is oblong; their muzzle round, and almost always more advanced than the mouth; the dorsal commencing on the mouth, extends, as well as the anal, as far as the caudal; their lateral line is straight; the side of the head opposite to the eyes is generally furnished with a sort of villosity; their intestine is long, several times folded, and without cœca.

The species common in our seas, and universally known, *Pl. solea*, L. Bl. 45. (the sole), is brown on the side where the eyes are, with a pectoral spotted with black, and is one of our best fishes.

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[1] *Pleur. podas*, Laroche, Ann. du Mus. XIII. xxiv., or *Pl. rhomboïdes*, Rondel. 313., which is also the same as the *Pl. argus* and *mancus* of Risso, 1st edit.; *Pleur. argus*, Bl., and *lunatus*, Gm., Bloch. 48., or better, Catesb. Carol xxvii.

We have several other species, particularly in the Mediterranean[1].

Some foreign species have no distinction between their three vertical fins[2].

We shall call

MONOCHIR, *Cuv.*,

Those soles which have only an extremely small pectoral on the side where the eyes are, and in which that of the opposite side is almost imperceptible, or is altogether wanting.

We have one in the Mediterranean, the *Linguatula*, Rondel. 324., (*Pleur. microchirus*), Lar. Ann. Mus. XIII. 356[3].

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[1] The *Pole* of Belon 143. and Rondel. 323., different from that of Paris, which is a plaice, has the eyes to the left, according to these two writers. I know not whether it is the *Rh. polus*, Risso, 2nd edit. f. 32. which is drawn with the eyes to the right. *Pl. ocellatus*, Schn. 40., the same as *Pl. Rondelettii*, Sh.; *Solea oculata*, or *Pégouze*, Rondel. 322.; *Pl. lascaris*, Risso, 1st edit. pl. vii. f. 32., and several foreign species, which we shall describe in our work on Ichthyology.

[2] *Pl. zebra*, Bl. 187.; *Pl. plagiusa*, L.; *Pl. orientalis*, Schn. 157.; *Pl. Commersonien*. Lacép. III. xii. 2., or *Jerré potoo*, A. Russel 70.; but the description Lac. IV. 656. is of another species of the subgenus Rhombus; the *Sole cornue*, Russel 72. figure not very exact; *Pl. jerreus*, Cuv., or *Jerée potoo*, B., Russel 71.; *Pl. pan*, Buch. xiv. 42.

[3] It is probably the *Pleur. mangilii*, Risso 310. Other species

ACHIRUS, *Lacép.*,

Are soles absolutely destitute of pectoral fins.

They may be divided according as their vertical fins are distinct, (the ACHIRI, properly so called [1]).

Or, as they are united to the caudal, *Plagusia*, Brown [2].

The third family, which we shall call

DISCOBOLI,

In consequence of the disk formed by their ventrals, comprehends two genera not very numerous.

LEPADOGASTER, *Gouan.*,

Are small fishes, remarkable for the following characters. Their ample pectorals, descending to the inferior surface of the trunk, receive stronger rays, fold a little in front, and unite one to the other under the

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exist, some of which are doubtless confounded among the achiri of authors. The *Pl. trichodactylus* must also belong to them. Add the *Pegouze* of Risso 308. 2nd edit. f. 33.; the *Mon. theophile*, Id.

[1] *Pl. achirus*, L., *Achire barbu*, Geoff. Ann. du Mus. tome I. pl. xi. It is not the same as that of Lacépède. It is essential to remark, that its barbs are not rays, but ciliæ, as is the case in the common sole, and as is found in several achiri; the *Ach. marbré*, Lacép. III. xii. 3. and IV. p. 660; *Ach. fascé*, Id.; *Pl. lineatus*, Sloane, Jam. pl. cccxlvi.; *Pl. mollis*, Mitch. ii. 4.

[2] *Pl. bilineatus*, Bl. 188., or *Jerré potoo*, E. Russel 74.; *l'Ach. orné*, Lacép. iv. p. 663.; *Pleur. arel*, Schn. 159.; *Pl. plagusiæ*, aff. Jam. Brown 445., different from *Pl. plagiusa*, L.; *Pl. potous*, Cuv., or *Jerrée potoo*, D. Russel 73.

throat by a transverse membrane, directed forwards, which is formed by the union of the two ventrals. For the rest, their body is smooth and without scales; the head broad and depressed; their muzzle salient and extensible; their gills but slightly cleft, furnished with four or five rays; they have but one small dorsal, opposite a similar anal; their intestine is short, straight, and without cœca: they want the natatory bladder, nevertheless they swim with vivacity along the shores.

In

Lepadogaster, properly so called,

The membrane which represents the ventrals extends circularly under the pelvis, and forms a concave disk; on the other hand, the bones of the shoulder form a slight projection behind, which completes a second disk with the membrane, which unites the pectorals. Our seas have several species.

In some the dorsal and the anal are distinct from the caudal, with which their membrane is nevertheless sometimes continued, but it grows narrower[1].

In others these three fins are united[2].

Gobiesox, *Lacép.*,

Have not these double borders, and consequently the interval between the pectorals and ventrals is not divided into a double disk, but forms only a single large disk, cleft on both sides, and prolonged by membranes. Their dorsal and anal are short, and distinct from the caudal; their gills are much more cleft[1].

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[1] *Lepadog. gouan*, Lac. I. xxiii. 3. 4., or *Lep. rostratus*, Schn.; *Lep. balbis*, Risso, pl. iv. f. 9., probably the same as the *Cyclopt. cornubicus*, Sh., or *Jura sucker*, Penn. Brit. Zool. No. 59.; *Lèpad. Decandolle*, Risso, p. 76.

[2] *Lepadog. Wildenow*, Risso, pl. iv. f. 10.

CYCLOPTERUS, *L.*,

Have a very marked character in their ventrals, whose rays suspended all round the pelvis, and united by a single membrane, form an oval and concave disk, which the fish employs as a sucker to fix itself to the rocks. For the rest, their mouth is broad, furnished at the two jaws and at the pharyngeals with small pointed teeth; their opercula are small; their gills closed towards the bottom, and furnished with six rays; their pectorals very ample, and uniting almost under the throat, as it were to embrace the disk of the ventrals. Their skeleton does not harden much, and their skin is viscous and without scales, but sown with small hard grains. They have a stomach tolerably large, numerous cœca, a long intestine, and a moderate natatory bladder. We divide them into two subgenera.

LUMPUS,

Have a first dorsal more or less visible, although very low, with simple rays, and a second with branched rays opposite to the anal; their body is thicker.

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[1] *Lepad. dentex*, Schn., Pall. Spic. vii. 1., the same as the *Cyclopterus nudus*, Lin. Mus. ad. Fr. xxvii. 1., and as the *Gobiésoce testar*, Lac. II. xix. 1.; *Cyclopterus bimaculatus*, Penn. Brit. Zool. pl. xxii. f. 1.; *Cyclopterus littoreus*, Schn. 199.

Cyclopterus lumpus, L., Bl. 90. (lump-fish). Has its first dorsal so enveloped by a thick and tuberculous skin that externally it might be taken for a simple hump of the back; three ranges of thick conical tubercles furnish it on each side. It lives, especially in the North, on medusæ and other gelatinous animals. Its flesh is soft and insipid. Heavy, and ill provided with the means of defence, it becomes the prey of phocæ, squali, &c. The male is said carefully to guard the eggs which it has fecundated[1].

LIPARIS, *Artedi*,

Have but a single dorsal, tolerably long, as well as the anal. Their body is smooth, elongated, and compressed behind.

We have one upon our coasts, *Cyclop. liparis*, L., Bl. 123. 3. 4[2].

The genus of which we are about to speak might also, like that of the pleuronectes, give rise to the erection of a particular family in the order of Malacopterygii subbrachiati.

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[1] *Cyclop. pavonius* is only a variety in age of the *lump*. The *Cyc. gibbosus*, Will. V. x. f. 2. appears only to be a *lump* badly stuffed. Add *Cyc. spinosus*, Schn. 46.; *Cyc. minutus*, Pall. Spic. VII. iii. 7, 8, 9.; *Cyc. ventricosus*, Id. ib. II. 1, 2, 3.? *Gobius minutus*, Zool. Dan. CLIV. B.

[2] It is the same as the *Gobioïde Smyrneén*, Lac. Nov. Com. Petrop. IX. pl. ix. f. 4. 6., and probably as the *Cyc. souris*, Lacép. IV. xv. 3., and perhaps as the pretended *Gobius*, Zool. Dan. CXXXIV. Add *Cyclop. Montagui*, Soc. Wern. I. v. 1.; *Cyclop. gelatinosus*, Pall. Spic. VII. iii. 1.; *Gobius*, Zool. Dan. CLIV. A.

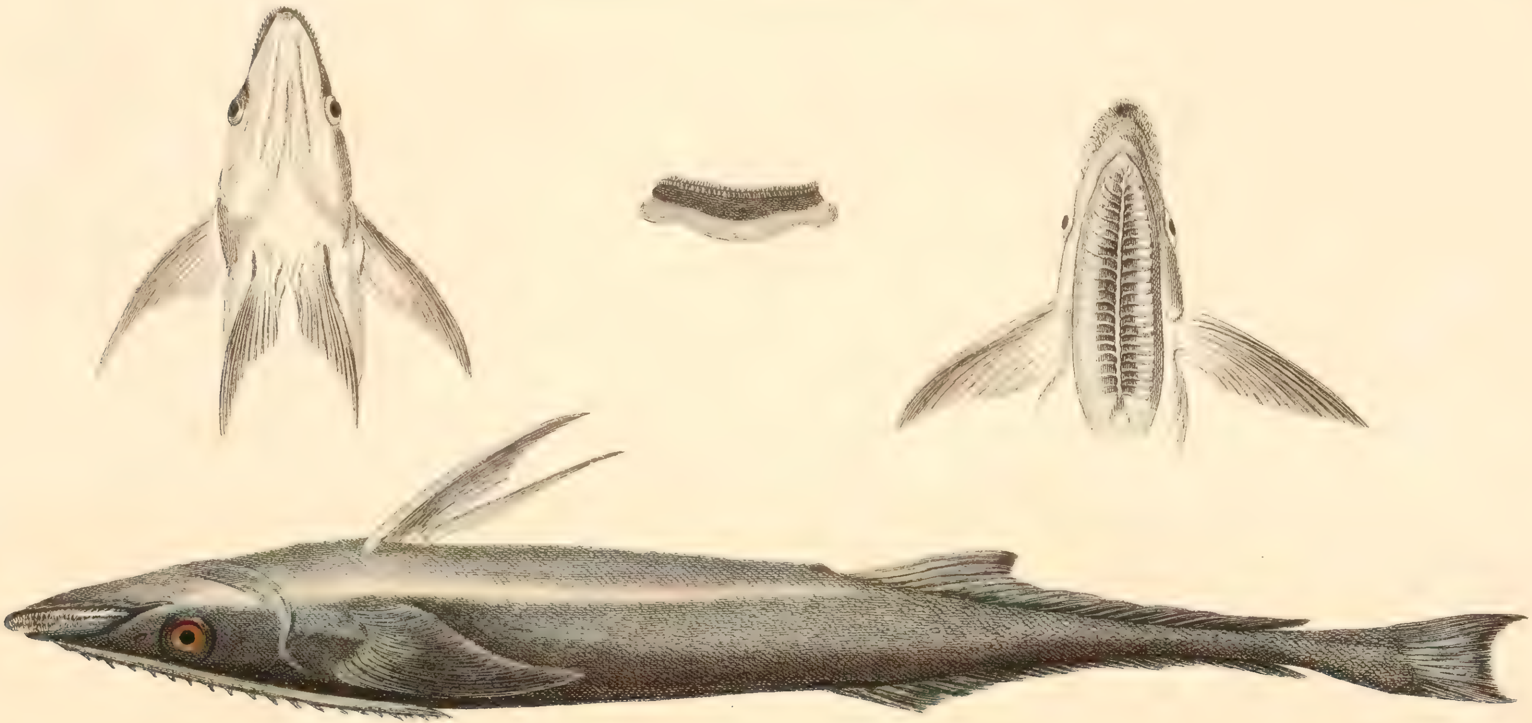
ECHENEIS, *L.*,

Are remarkable among all fishes for a flatted disk which they bear upon the head, and which is composed of a certain number of cartilaginous plates, transverse, obliquely directed backwards, dentated or spinous at their posterior edge, and moveable, so that the fish, by making a vacancy between them, or by hooking the spines of their edges, fixes itself to different bodies, such as rocks, vessels, fish, &c. which has given rise to the fable that the echeneis can suddenly arrest the course of the most rapid ship.

This genus has the body elongated, and clothed with small scales; a single soft dorsal opposite the anal; the head altogether flat above; the eyes on the side; the mouth cleft horizontally and rounded; the lower jaw more advanced, furnished, as well as the intermaxillaries, with small pectiniform teeth. A regular range of small teeth, like ciliæ, along the edge of the maxillaries, which form the external edge of the upper jaw; the anterior edge of the vomer is furnished with a band of cardiform teeth, and so is all its surface, which is broad, and rough, as well as that of the tongue. They have eight branchiostegous rays; their stomach is a wide cul-de-sac; their cœca six or eight in number; their intestine ample, but short: they want the natatory bladder.

The species are not numerous. The most known, of the Mediterranean, celebrated under the name of *remora, Echen. remora,* L., Bl. 172. (sucking-fish), is short, and has but eighteen plates to its disk. Another species, more elongated, *Ech. naucratus,* L., Bl. 171., has twenty-two; and a third, the largest of all, *Ech. lineata,* Schn., Linn. Trans. I. pl. xvii., has but six.

We have discovered one, *Ech. osteochir,* Cuv., in which the rays of the pectorals are osseous, compressed, and terminating in a slightly crenated palette.



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SUPPLEMENT

ON THE

THIRD ORDER OF FISHES.

MALACOPTERYGII SUBBRACHIATI.

In the first family of this order, **Gadites**, the subdivision which claims our first and principal attention is the subgenus **Morrhua**, the type of which is the well-known *cod*.

When towards the commencement of the tenth century, Gaspard de Corte Real, a Portuguese gentleman, jealous of the Spaniards, and their rival in the desire of discovering new countries, cast anchor in the midst of the fogs on the savage coasts of a sterile island, on landing for the first time in Newfoundland, he certainly did not think that he was opening for Europe a source of riches, more profitable, equally certain, and far less inexhaustible than those which the proud rivals of his nation derived from the mines of Potosi, whose conquest had been purchased by such effusions of human blood. The fact, however, is certain; and, in the hands of the industrious fishermen of Europe, a fish, in other respects by no means remarkable, has become the origin of the most assured and most lucrative branch of commerce.

The weight of the common cod varies between twelve and eighty or a hundred pounds. It is very voracious, and feeds on fish, on herrings more especially, on mollusca, on worms, and crustacea. The digestive power of its gastric juices is so great that in less than six hours the prey which it has swallowed has undergone all the elaboration necessary to complete the act of digestion; under their influence the shell of the crab grows red, just as it does under the action of boiling water, and that even before the flesh is reduced into chyme. Its gluttony, moreover, is so great, that it will devour the young of its own species, swallow pieces of wood, or other substances, which cannot contribute to its nourishment, but which it has the singular faculty of rejecting in the same manner as the squali and vultures do, when it is incommoded by their presence in its viscera.

The growth of this fish appears to be particularly rapid, though the degrees of its progression are not ascertained. It dies the moment it is taken out of its natural element. It frequents the salt water alone, and remains habitually in the depths of the sea, never ascending into rivers, nor even generally approaching the shores, except in the spawning seasons. It is particularly met with in that part of the Northern Atlantic comprehended between the fortieth and the sixty-sixth degree of latitude. It is not an inhabitant of the Mediterranean or other interior seas whose entrance is nearer to the equator than the fortieth degree.

The cod is taken in the seas of Greenland, Iceland, Norway, Denmark, Russia, Sweden, and Prussia; in the Channel to the east and north of England, Scotland, and Ireland, near the Orkneys, New England, Cape Breton, &c., but more especially at Newfoundland, where, in a sort of sub-marine mountain, which, at the depth of sixty and even a hundred feet below the surface of the ocean, occupies an extent of more than a hundred leagues in length and sixty in breadth, there is always an astonishing assemblage of these animals. Three or four hundred of them may be taken in a day, with no other trouble to the fisher than that of continually dropping and drawing up his line.

When the necessity of depositing or fecundating their eggs, or of providing for their own subsistence, impels the cods of the ocean towards the shores, it is constantly at the commencement of spring that they make their appearance. This period, however, of course varies according to the countries which they inhabit, both in Europe and in North America. It is in the month of February, for instance, that they appear in Norway, Denmark, Scotland, England, &c.; at Newfoundland it is in the month of March.

The flesh of these fishes, which is white, firm, and of most excellent flavour, renders them exceedingly valuable to us. It is capable of being preserved in a state fit for eating much longer than that of most other species of this class. Its consumption is consequently extended through the four quarters of the globe. Almost all the parts of the cod are adapted for the nourishment of man and of animals, or for some other purposes of domestic economy. The tongue, for instance, whether fresh or salted, is a great delicacy; the gills are carefully preserved, to be employed as baits in fishing; the liver, which is large, and good for eating, also furnishes an enormous quantity of oil, which is an excellent substitute for that of the whale, and applicable to all the same purposes; the swimming-bladder furnishes an isinglass not inferior to that yielded by the sturgeon; the head, in the places where the cod is taken, supplies the fishermen and their families with food. The Norwegians give it with marine plants to their cows, for the purpose of producing a greater proportion of milk. The vertebræ, the ribs, and the bones in general are given to their cattle by the Icelanders, and by the Kamtschatdales to their dogs. These same parts, properly dried, are also employed as fuel in the desolate steppes of the shores of the Icy Sea. Even their intestines and their eggs contribute to the luxury of the table.

Considering the immense resources that the cod presents to our wants, it is not surprising that its fishery should have become a real and complicated art, with its laws and its privileges, that it should occupy an immense multitude of men, and that every year entire fleets, in which as many as twenty thousand sailors of a single nation have been employed, repair to the northern latitudes for the sole purpose of catching, preserving, and bringing back this fish to their respective countries. Such expeditions are equally favourable to the increase of subsistence, of commerce, of industry, of population; to the improvement of the naval power, of the general strength, of the security and the happiness of nations.

For a series of generations the annual destruction of these fishes by man has been so prodigious, that, but for the immense extent of the resources of re-production accorded to it by nature, the species must have long since become extinct; indeed, it is difficult to conceive how it has been preserved up to the present time, when we reflect that from 1368 the inhabitants of Amsterdam have carried on their fisheries on the coasts of Sweden; that in the first six months of the year 1792, according to the report of the minister Roland to the National Convention, there issued from the ports of France, for the cod fishery alone, two hundred and ten vessels, carrying altogether 191,153 tons; that every year more than six thousand vessels of all nations are occupied in this fishery, and bring back more than 36,000,000 of cods, salted or dried. To all this we may add the devastation carried on among these fishes by the large squali and certain cetacea, the destruction of a multitude of young individuals by the other inhabitants of the water, and by sea fowl, the failure of fecundation as to a great number of eggs, and the accidents which happen to a great number of others. After all these considerations the wonder would be that any of the species remain, if we did not know that each mother can annually give birth to above nine millions of young.

In the neighbourhood of the Isle of Man there is a variety of the common cod named *red cod*, or *rock cod*, the skin of which is of a brightish vermilion colour. The flesh of this fish is much esteemed, and considered superior to the other.

The *Morrhua Æglefinus* is the fish so well known to us under the name of *haddock*. It has many characters in common with the preceding species, and like it, is found in the vast Northern Ocean, where it voyages in large troops, which cover an immense extent of surface. It does not pass the Sound, for it has not yet been seen in the Baltic. It comes annually, towards the months of February and March, to the shores of Northern Europe, either to deposit or fecundate its eggs; and in stormy weather it seeks an asylum from the violence of the elements in the deepest parts of the ocean, on the sand, or in the marine plants.

During winter a certain number of haddocks remain near the shores, where they find more easily than in the great waters the nutriment which is suitable to them. Sometimes they even choose this season to approach the coasts closely, where they re-appear almost upon a stated day. From 1766 the fishermen of Yorkshire have remarked, that towards the 10th of December these fishes may be attacked with advantage. On the moment of their arrival they form a bank or shoal three miles in breadth, reckoning from the coast, and eighty miles in length from Flamborough Head to the mouth of the Tyne, below Newcastle. Pennant confirms this statement, and tells us, that on these occasions the haddocks are so numerous that three fishermen, within the space of a mile, may fill their boats twice a day. In autumn they are equally plentiful on the shores of Holland and East Friezland, as well as near Heligoland, whence they are transported to Hamburgh.

When the surface of the sea is frozen near the shore, these fishes congregate under the crevices which separate the ice. The inhabitants of the coasts in the neighbourhood of the Polar circle, take advantage of this instinct by breaking the ice constantly, and thus producing the crevices which answer their purpose. It is thus that the Greenlanders are enabled to catch the haddocks with their hands.

The seals assemble round those vacancies, whether natural or artificial, to devour the haddocks, during the winter; and the *isatis*, or Arctic foxes, equally as cunning as our own, come to agitate the water of these lagoons with their paws, and prey upon the first of these fishes which are attracted by the noise. The large cods also, in those latitudes, prey upon the haddocks.

Although so much smaller than the cod, the haddock is equally gluttonous and destructive. They feed on serpulæ, mollusca, crustacea, smaller fishes, and more particularly on herrings.

The haddocks frequent our European coasts during most of the year; but the large ones are taken only in winter: the small ones usually enter the nets intended for other species of fish, such as herrings.

The quality of the flesh of the haddock varies according to the places in which these fishes are found, their age, their sex, and the period of the year. It is in general white, firm, very agreeable to the taste, and easily cooked. It is best in May and June. It may be salted, or dried like the cod, but is not so good, when thus prepared, as the latter.

The *Gadus callarias*, or *Dorse*, is seldom more than eleven or twelve inches long, and seldom weighs more than two pounds. It habitually frequents the waters of the Ocean, towards the coasts of northern Europe, and is particularly common in the Baltic Sea. It keeps most generally at the mouths of great rivers, into the head of which it sometimes ascends with the salt-water. It is known throughout the whole of the north, and generally taken in the month of June. It feeds on marine worms, crustacea, mollusca, and young fishes.

Its flesh, which is something like that of the whiting, is more agreeable when fresh than that of any other species of gadus. Although in general it is very white, it has sometimes a manifest tint of green, which is attributed to its stopping for some time among the algæ, which abound in the muddy and sandy bottoms near the northern shores.

The Icelanders salt and dry this fish, but the Greenlanders frequently eat it half rotten.

The *Gadus barbatus*, or *tacaud*, is about eighteen inches or two feet long. It inhabits the seas of north Europe, often at considerable depths. It approaches the shores at spawning time, and lives on crustacea and small fish. It is an article of food with the Greenlanders, though not in very high estimation.

The MERLANGUS is a subgenus, the type of which is the *whiting*, a fish very common on our coasts, and in great esteem. The species of fishes which compose this subgenus, are of considerable utility from the abundant and wholesome food which they supply to man. Their flesh is also recommended by physicians to persons with weak and exhausted stomachs. Among them is particularly distinguished the *common whiting*, *Merlangus vulgaris*. It inhabits the European seas, and chiefly towards the north. It feeds on worms, mollusca, crabs, and young fishes, and often approaches the shores, which causes its fishery to be carried on for most part of the year, though with less success at certain seasons than at others. It more particularly abandons the high seas, not only at the period of the spawning, but likewise when it hopes to find towards the land a more abundant degree of nourishment, and an asylum from the large marine animals which pursue it. These circumstances are of course much influenced by the seasons. On some of the French coasts, the months of January and February are most favourable for the pursuit of this fish, while on many of those of England and Holland, the summer months are chosen in preference. The whitings sometimes appear in such numbers that their troops may occupy a space of three miles long, and a mile and a half broad.

The fishery of the whiting is very lucrative on the northern coasts of Europe, principally around England and Holland, and is performed with either line or net.

This fishery is the more valuable as the fish can be very well preserved, and sent to considerable distances. Its abundance is so great, on our coasts in particular, that the quantity taken cannot be consumed fresh ; and much of it is therefore salted and dried. The same is the case on the coasts of Ostend, Bruges, and Ghent. It must be confessed, however, that the whitings lose much flavour by those operations.

The *merlangus carbonarius*, or *coal-fish,* is found in the north Atlantic, and, as it would seem, also in the Pacific Ocean. Towards the months of February and March, it approaches the coasts of England to deposit its eggs. In the following summer, the young fishes which come from these eggs, and grow pretty fast, are taken in great abundance. The adult are caught all the year round, but more especially in summer.

This fish, according to M. Risso, is found in the Mediterranean ; but it is very rare, though it may be sometimes seen in the markets of Nice.

When the cod is abundant on our northern coasts, this fish is in no great request ; but when the latter is scarce, the coal-fishes are salted in great quantity, and then are not very easily to be distinguished from the cod. They constitute an important article of exportation.

When the coal-fish is young, its flesh is very delicate; but after a year or so it becomes hard and coriaceous, and never has such a good flavour as the cod. The Icelanders hold it in no estimation, because the whiting is so plentiful on their coasts. In Norway it is the food of the poor alone; but oil is made from its liver.

The *pollock (merlangus pollachius)* lives in large troops in the Atlantic Ocean, and the northern seas of Europe, and is partial to the stormy latitudes of the Norwegian coasts, and those of the north of England. It is sometimes found in the Mediterranean in winter, in the Baltic, near Lubec, and in the north sea, near Heligoland; but it never appears assembled in troops, and each individual lives in an isolated state. It remains more usually on the surface than in the depths of the sea.

The type of the subgenus MERLUCCIUS is the fish we call *hake.* It is taken in equal abundance in the Atlantic Ocean, and in the Mediterranean sea, where the Provençals call it *merlan,* the name of the whiting. In consequence of the grey tint of its back, it has been spoken of by Aristotle, Oppian, Athenæus, Ælian, and Pliny, under the names of *ονος* and *asellus.* It is a very voracious fish, and pursues herrings and mackerel with great avidity. It swims in very numerous troops, and is the object of a fishery equally abundant in product and easy in execution.

The hake is so abundant in the bay of Galway, on the western coast of Ireland, that this bay is named in some ancient maps the *bay of hakes.* It is equally abundant at Penzance in Cornwall. Since the naval engagement of 1759, it also habitually frequents the neighbourhood of Belle-Isle, where, according to the observations of Querhoent, it was never seen before. This statement, however, we think must be received with some degree of suspicion.

Its flesh is white and flaky; its liver is particularly delicate, and was a dish in much request with the ancients. In the countries where the hake is abundant, especially towards the north, it is dried and salted for exportation like the cod. Thus prepared, both these species of fish are called indiscriminately in commerce, *stock-fish*, which is a German phrase, meaning literally *stick-fish*, because they are extended on sticks for the operation of drying.

The name of LOTA is given to another subgenus of the gadus, the type of which is our well known *ling*, (*Lota molva*). This fish is equally abundant with the cod, and attains to a considerable size, for it is commonly three or four feet in length, and may attain to seven. It inhabits the same seas as the cod, and is frequently met with around our coasts, those of Ireland, the Hebrides, &c. It is fished and prepared in the same manner as the cod, and is preserved as easily. After the cod and herring, it is one of the principal sources of wealth which the sea presents to the enterprize and industry of man. Almost 900,000 pounds weight of it is annually exported from Norway. It is generally taken from the month of February to the end of May in our seas.

The *Gadus lota*, (Burbot), passes its life in the fresh water, in lakes and rivers, where it ascends to very considerable distances. It is very abundant in some countries of Europe, of North Asia, and of the Indies, where it conceals itself under stones in the clearest waters, waiting patiently in ambuscade for the passage of the aquatic insects and young fishes which constitute its food. It grows very fast, spawns towards the end of December and in January, and multiplies considerably.

The second family of this order is composed of what are vulgarly called *flat-fish*, the first of which is the PLATESSA, or *plaice*.

The plaice, (*Pl. platessa*, Lin.) inhabits the Baltic, the North Atlantic, and many other seas.

The *Platessa flesus*, (the flounder) is taken in spring near the sea-shores, and the mouths of rivers, especially in the Baltic Sea, and the North Atlantic Ocean. It even penetrates into rivers, and comes pretty high into those of our country.

It is easily accustomed to live in all kinds of water, and as by enclosing it in proper vessels, it can be transported alive to a considerable distance from its ordinary sojourn, it has been naturalized and multiplied in many ponds in Friezland.

The goodness of its flesh, the flavour of which in general is much inferior to that of the plaice, varies according to the season of the year in which it is taken, according to the food which it can obtain, and according to the country which it inhabits. It is said, for instance, to be better in the neighbourhood of Memel than in the other parts of the Baltic, and that the flesh of individuals taken in fresh-water, is softer and less savoury than that of the flounders of the sea. It is also agreed that this fish is larger and more fleshy in the fine season than at any other time.

Of Rhombus, the *Rhombus maximus*, or *turbot*, is a well known and most celebrated fish. It arrives at very large dimensions. Some have been seen five or six feet long, and on the coast both of England and France, it often weighs twenty-five or thirty pounds. Rondelet, indeed, tells us that he has seen the turbot five cubits in length, four in breadth, and a foot in thickness.

It frequents the Northern Ocean, the Baltic, and the Mediterranean, and is generally very abundant in those tracts which it inhabits.

It feeds on small fish, crustacea, worms, &c., and is very voracious. It is extremely cunning in the pursuit of its prey, which leads it to sojourn near the mouths of rivers, or at the entrance of the ponds which communicate with the sea, places which habitually abound in small aquatic animals, and are filled with a thick and unctuous mud, in which it sinks.

Notwithstanding its extreme voracity, this fish very seldom attacks anything but living prey, or what is quite fresh; the fishermen, therefore, generally prefer for taking it, to join to the pieces of cod and herrings with which they bait their lines some small fish still alive.

It is seldom fished for with the net, long lines, baited in the mode just mentioned, being preferred. These lines are sometimes prodigiously long.

The flesh of the turbot is in great request, in consequence of its exquisite flavour, on which account the French vulgarly call it *water* or *sea-pheasant*. It is white, fat, flaky, and delicate. It has exercised the skill and ingenuity of the great professors of gastronomy, in a variety of culinary preparations, from the time of Apicius down to that of Ude and Kitchiner.

The Romans entertained a profound respect for the turbot, as the two following passages from Horace prove.

——— Cum passeris, atque
Ingustata mihi porrexerit ilia rhombi.

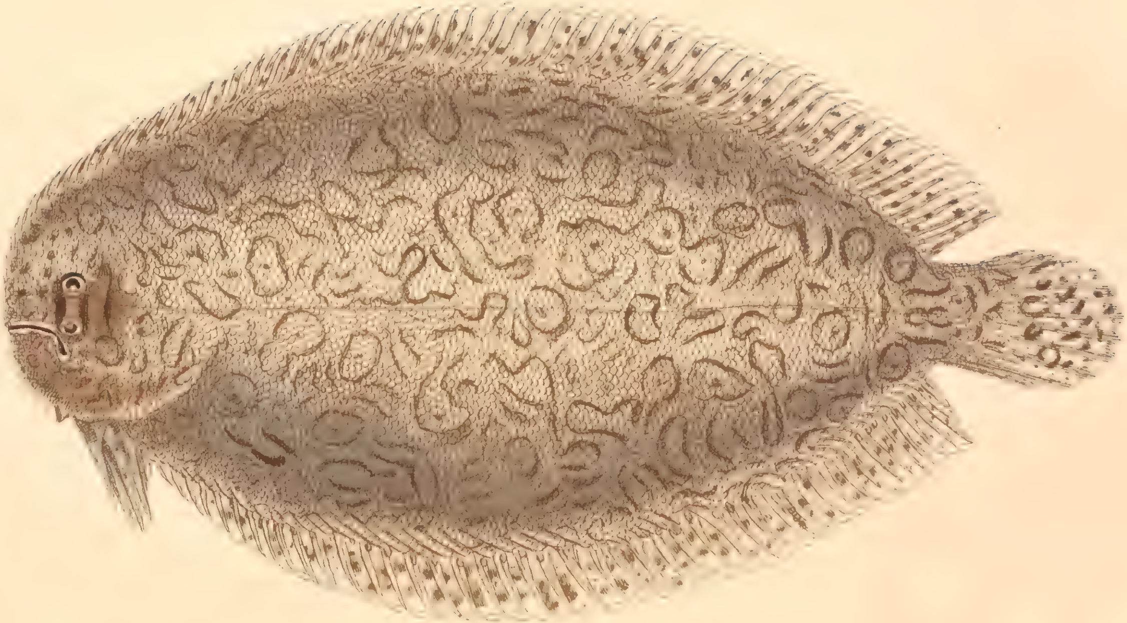
——— Esuriens fastidit omnia, præter
Pavonem, rhombumque.

The *Pleuronectes Rhombus*, or *R. barbatus*, (the brill,) is common in the North Atlantic as well as in the Mediterranean. It habitually frequents the French coasts, but is still more plentiful in those of Sardinia, and also, according to Adanson, round the Azores. It sometimes penetrates into rivers, and more particularly into the Elbe.

This fish grows to a very considerable size, and is the one thus spoken of by Martial:

Quamvis lata gerat patella rhombum,
Rhombus tamen est latior patellâ.

It was also an enormous individual of this species which was presented to Domitian, on which important occasion he



Pleuronectes ornatus

assembled the Roman senate to deliberate concerning its disposal, and not the common turbot, as many authors have supposed.

This fish has at all times been in great request, and deserved to be so: its flesh is firm, and exquisitely flavoured, and, in short, it is a worthy rival of the turbot.

In the subgenus SOLEA the *common sole* is well known. It inhabits a great number of seas; it is found not only in the Baltic and the North Atlantic, but also in the neighbourhood of Surinam, and in the Mediterranean, where there is an abundant fishery of it on the coasts of Sardinia. It also inhabits the mud at the mouth of the Var; and the late Mr. Bowdich observed it in the Gambia. The size of the soles appears to vary according to the waters which they frequent. The *Pleuronectes ornatus*, is from a specimen in the British Museum, brown with darker spots.

The soles which are said to surpass all others in the excellence of their flesh are those of the Cape of Good Hope.

Near the mouth of the Ouse a variety of the sole is taken, under the name of *cardine,* with a large and elongated head; but the flesh is less delicate.

The genus LEPADOGASTER, of the family of DISCOBOLI, was created by Gouan, and has since been adopted by all ichthyologists. The name by which it is designated is derived from the Greek λεπας, *a shell*, and γαστηρ, *belly,* and indicates the disposition of the ventrals, which form a sort of conch at the lower part of the body.

The *Lepadogaster Gouanii* is found in the Mediterranean Sea, and particularly under the calcareous pebbles of the shores of Nice. Bonnaterre has figured it under the name of *Bouclier porte-ecuelle;* it has also been named *Barbier;* and in the department of the Maritime Alps it is called *pei-poure,* according to M. Risso. M. Cuvier considers it to be the same animal as the *Lepadogaster rostratus* of M. Schneider.

The *Lepadogaster Balbis* inhabits the sea of Villa-Franca, in the environs of Nice. It is from three to four inches long. It was first described by M. Risso. M. Cuvier thinks that it may well be the same as the *Cyclopterus cornubicus* of Shaw, or the *Jura sucker* of Pennant.

Lepadogaster Candolii, about the length of three inches, is found in the sandy depths of the Sea of St. Hospice, also near Nice. It presents several variations, all of which in that country bear the name of *Pei S. peire*. M. Risso has named it from the learned botanist Decandolle, as he named the preceding from the Professor Balbis of Turin. He has dedicated another from the same sea to the botanist Willdenow.

The word CYCLOPTERUS, derived from the Greek κυκλος, *circulus*, and πτερα, *pinna*, and signifying *fins in a circle*, indicates very well the principal character of these fishes, the union of the ventral fins.

The ancients do not seem to have been acquainted with the fishes of the genus *Cyclopterus*. Nevertheless George Pisidas, a Greek writer of the seventh century, has indicated them under the name of *Naucrates*, conjointly with the echeneis, since he speaks of their fin, "*quæ ad medium pectus circumplicata cingit cymbali instar*."

The colours of the *Cyclopterus lumpus* vary according to sex and age. The tubercles with which its body is furnished also vary in their conformation; some are flatted, some are rounded, and others sharp.

The organs of its sensations, especially those of hearing and sight, have appeared to naturalists to be more perfect than those of other fishes. Some persons have even regarded as a seat of touch, or a sort of hand of considerable extent, the disk formed below by the union of the ventrals. Bloch has proved, by his dissections, that the intestinal canal of the lumpus is six or seven times longer than the body, and as it is a very bad swimmer, it would have been exposed to perish of hunger without this peculiarity, which enables it to wait longer for its prey by preventing digestion from taking place with so much rapidity.

The *lumpus*, which is also called in French *licone de mer*, or *bouclier*, and in English *lump-sucker*, remains habitually at the bottom of the sea, concealed under the rocks, or attached to their base, by means of its clypeïform fin; and very considerable force is required to pluck it thence, as has been proved by the experiments of Hanov and Pennant. Its food consists principally of marine worms and small fish; but as it is heavy, and possessed of but few means of defence, it easily becomes the prey of seals, squali, and other voracious inhabitants of the water. Its flesh is mucous, soft, and far from agreeable. It is eaten, however, in some northern countries, in the seas of which this fish is more especially to be found. In Ireland it is even salted, and dried for preservation during the winter; but, in general, the only purpose to which it is applied is the making of baits to catch other fish.

The lumpus is one of those fishes concerning which the greatest number of marvellous stories have been related. M. de Lacépède says, in an eloquent and frequently quoted passage, " Let those whose delicate sensibility seeks with so much interest, and finds with so much pleasure, the images of touching affection presented by some few happy beings, in the midst of the immense assemblage of the productions of creation, on which nature has so unequally bestowed the breath of life, and the capacity of sensation, listen for an instant to what some naturalists have related concerning the fish whose history we are now writing. Among the innumerable inhabitants of the ocean which yield but to the wants of the moment, to a gross appetite, to a pleasure as little shared as it is fugitive, which know neither mother, companion, nor young, we are told that a favoured animal was to be found, who by an irresistible instinct, preferred one female to all others, attached himself to her alone, followed her everywhere, aided her in her searches, succoured her in her dangers, received attentions from her equal to those he had bestowed, facilitated her delivery by a sort of amorous play, lost not his tenderness after the moment of fecundation, but retained the constant feeling by which he was inspired until the young came forth ; guarded along with her whom he had chosen the fruits of their union, defended them with a courage also exhibited by the mother, but displayed by him with more success, as being the larger and the stronger of the two; and who, after having preserved them from the cruel tooth of their enemies until such time as when a little developed they could at least escape death by flight, waited, always constant and always attentive, near his companion, until a new spring restored them to renewed enjoyments. How much pleasure might such a picture produce, at least for a moment, in pure and feeling minds! But why should this satisfaction, always so rare, prove as short as the recital which produced it? Wherefore should the austerity of truth command the historian of nature to dispel so pleasing an illusion? Constant love, tenderness ever wakeful, conjugal fidelity, unlimited devotion to the objects of affection, wherefore has the picture of your delightful consequences been placed in the midst of the ocean only by the feeling heart and the fertile imagination? All the foundation for it is this: two of these fishes must have frequently been observed placed one near the other, and a long time motionless, on the rocks or the sand of the sea; they have been supposed to be male and female. Their vicinity and their repose have been considered as the effect of mutual affection, and observers have believed themselves not slightly authorized to attribute to them the long fidelity and the durable attentions, which they have been pleased to depict in such glowing colours."

The *Cyclopterus spinosus* is from the seas of the North, and particularly inhabits the gulfs and creeks of the southern shores of Greenland. It spawns in the month of March. Its eggs are fawn-coloured. The inhabitants never eat its flesh, though they do not despise that of the lumpus.

The *Cyclopterus minutus* inhabits the Atlantic Ocean, and the *C. nudus* the Indian seas.

The species of LIPARIS, which in the text forms a subgenus, is the genus CYCLOGASTER of Gronovius. It is easily distinguished from lepadogaster, which have the pectoral fins double and united; and from cyclopterus, in which there are two dorsals, and the odd fins are isolated, whereas in this subgenus the odd fins are united, and there is but a single dorsal.

The skin of the *C. liparis* is loose, and invested with a thick viscous matter: its size is about eighteen inches. This fish, whose flesh is fat and mucous, feeds on insects, worms, and small marine animals. It lays at the end of winter or the beginning of spring. Steller tells us that its eggs are about the size of a pea. It serves as food to the inhabitants of Greenland. It inhabits the most northern seas in the vicinity of the pole. It is to be found on all the coasts of the Icy Sea, even as far as Kamtschatka, and often in the mouths of the rivers which roll thither their ices and their waters. It has been caught sometimes both in England and Holland, particularly at Amsterdam, in that arm of the sea called Y.

The *C. gelatinosus* was first described by Pallas, and its flesh is so bad that not even the dogs themselves will eat thereof.

THE

FOURTH ORDER OF FISHES.

MALACOPTERYGII APODES.

May be considered as forming but one natural family, which is that of

Anguilliformes,

Fishes which have all an elongated form, a thick and soft skin which scarcely suffers their scales to appear, but few crests, and no cœca. Almost all have natatory bladders, which frequently exhibit singular forms.

The great genus,

Muræna, *L.*,

Is recognized by small opercula, surrounded concentrically with rays[1], and enveloped, as well as the rays, in the skin, which opens only very far back, by a hole or sort of funnel, which, sheltering the gills better, allows these fishes to remain some time out of the water without perishing. Their body is long and slender; their scales, as it were encrusted in a fat and thick skin, are not clearly visible until they are dried up. They are all destitute of ventrals and cœca, and have the anus pretty far back.

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[1] None of these fishes, as far as we know, want either opercula or rays, as some naturalists have supposed. The common muræna has seven rays on each side, the *Muræna colubrina* has twenty-five; these rays are even very strong in the *Synbranchus*, in which the

They have been successively dismembered into five or six genera, which we are of opinion should be still subdivided.

ANGUILLA, *Thunberg and Shaw.* MURÆNA, *Bloch,*

Are distinguished by the double character of pectoral fins and of gills opening on each side under those fins. Their stomach is a long cul-de-sac; their intestine pretty nearly straight; their air-bladder elongated, has towards its middle a peculiar gland.

MURÆNA, *Lacép.* (EELS, properly so called),

Have the dorsal and caudal sensibly prolonged around the end of the tail, and forming there by their union a pointed caudal.

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operculum is otherwise complete, and formed of all the pieces which commonly belong to it.

N.B. The *Echelus*, Rafinesque, Nov. Gen. p. 63. pl. xv. 1. 3. pl. xvi. f. 2. and 3. should be some of them eels, others congers, without opercula to the gills, but we doubt the reality of this character.

In the TRUE EELS the dorsal commences at a tolerable distance behind the pectorals.

Some have the upper jaw shorter.

Our common eels are of this subdivision; our fishermen recognize four sorts, which they assert form so many species, but which authors confound under the name of *Muræna anguilla*, Linn.; their French names are *Anguille verniaux*, which is I believe the most common; *Anguille long-bec*, the snout of which is more compressed and pointed; *Ang. plat-bec, Grig-eel* of the English, which has it more flatted and obtuse, and the eye smaller; and *Ang. pimperneaux*, *Glut-eel* of the English, which has it shorter in proportion, and whose eyes are larger than those of the others[1].

In others the upper jaw is longest[2].

CONGER, *Cuv.*

The dorsal fin commencing close to the pectorals, or even on them; the upper jaw is longest in all the known species.

Mur. conger, L., Bl. 155. (The Conger Eel). Is found in all the seas of Europe; it attains five or six feet in length, and the thickness of a man's leg; the dorsal and anal fins are edged with black; the lateral line dotted with whitish. It is not in much request for the table.

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[1] We shall give a comparative description and exact figures of these in our great history of fishes.

[2] *Mur. longicollis*, Cuv.—Lacep., II. iii. 3. under the false name of *Muræna myrus*.

Mur. myrus, L. Rondel, 407 [1]. Has the form of a conger, but is smaller; it is known by spots on the snout, a band across the occiput, and two rows of dots on the nape; all these are of a whitish colour [2].

In some foreign congers the dorsal fin commences even before the pectorals, or at least at their base [3].

The

OPHISURUS, *Lacép.*,

Differs from the true eels in the dorsal and anal, which cease before they reach the end of the tail, which is thus deprived of a fin, and terminates abruptly. The posterior orifice of the nostril opens on the very edge of the upper lip, and the intestines are similar to those of the common eel; a portion of them, however, extends into the base of the tail beyond the anus.

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[1] *Myrus*, a fish so called by the ancients, which some have considered as the male of the Muræna; Rondelet was the first who applied it to this species, which is very distinct, although since Willughby, no one has properly described it but Risso; no drawing has been made of it.

[2] The Mediterranean produces other small species of Congers described by Laroche and Risso under the names of *Mur. balearica*, Lar., Ann. du Mus., XIII. xx. 3. or *Mur. cassini*, Risso, *Mur. mystax*. Lar., Ib., XXIII. 10;—*Mur nigra*, Risso, p. 93. The *Mur. strongylodon*, Schn., 91. which is far from being a variety of *myrus*, as that author supposes, should also be referred to them. —The *Anguille marbrée*, Quoy and Gaym., Zool., Voy. de Freycin., pl. li. f. 2.

[3] *Mur. talabou*, Russel, 38.;—*Mur. savanna*, Cuv., from Martinique;—the *C. à chapelet*, Krusenst., V. lx. 7.

The pectoral fins of some are of the ordinary size; the teeth are trenchant and pointed.

Mur. serpens, L., Salv., 57. (The Snake Eel). More than six feet in length, and of the thickness of a man's arm; brown above, silvery beneath; the snout slender and pointed; there are twenty rays in the branchial membrane. From the Mediterranean[1].

In others the pectorals are so extremely small, as sometimes to escape the notice of observers. They connect the eels with the Muræna; their teeth are obtuse[2].

MURÆNA, *Thunb.*,—GYMNOTHORAX, *Bl.*,—MURÆNOPHIS, *Lacép.*

The Murænæ, properly so called, have no vestige of pectorals; their branchiæ open on each side by a small hole; their opercula are so thin, and their branchiostegal rays so slender and concealed under the skin, that able naturalists have denied their existence. The stomach is a short sac, and the natatory bladder small, oval, and placed near the upper part of the abdomen.

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[1] This is doubtless the place of *Mur. ophis,* Bl., 154, *Ophis hyala,* Buchan., pl. v. f. 5;—*Ophis longmuseau,* Quoy et Gaym., Zool. Voy. Freycin., pl. li. f. 1;—*Ophisurus guttatus,* Cuv., a new species from Surinam.

N.B. The COGRUS, Rafin., Nov. Gen., p. 62. must be Ophisuri without branchial membranes; we fear there is some mistake in this as in his Echelus.

[2] *Mur. colubrina,* Bodd., or *annulata,* Thunb., or *Murenophis colubrina,* Lac., V. xix. 1;—*Mur. fasciata,* Thunb.;—*Mur. nob. maculosa,* given under the name of *Ophisurus ophis,* Lacep., II. vi. 2;—the *Oph. alternan,* Quoy et Gaym., Zool. Freycin., pl. xlv. f. 2.

Those species which have a very visible dorsal and anal, are the *Murænophis* of Lacépede.

Some of them have a single row of sharp teeth in each jaw.

The most celebrated is

Mur. helena, L., Bl. 153. (the common muræna). A fish very much extended in the Mediterranean, and for which the ancients had a very high esteem. They reared them in vivaria, and the story of Vedius Pollio has been frequently repeated, who caused his offending slaves to be thrown to his eels. This fish reaches the length of three feet or more. It is altogether marbled with brown and yellow. Its bite is often severe[1].

Others have sharp teeth in two ranks in each jaw, independently of a rank to the vomer[2].

Others have conical or round teeth on two ranks to each jaw, and such is, in the Mediterranean,

M. unicolora, Laroche, Ann. Mus. XIII. xxv. 15.,

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[1] Add the *Moringa* of the Antilles (*M. Moringa,* Cuv.), Catesb. II. xxi.; *M. punctata,* Bl., Schn.; *M. Meleagris,* Sh., or *M. pintade,* Quoy and Gaym., Zool. de Freyc. pl. lii. f. 2.; *M. pratbernon,* id. ib. f. 2.; *M. favaginea,* Bl., Schn. 105.; *M. pantherine,* Lac., or *M. picta,* Thunberg.

[2] *Murenophis gris,* Lac. V. xix. 3.

M. Christini, Risso. Altogether covered with small lines or small points, brown and crowded, which make it appear of a uniform brown [1].

There are some with round lateral teeth on a single range; the vomerian, equally round, are on two ranges; the anterior are conical [2].

We have some with round lateral teeth on two ranges, with vomerian teeth equally round on four ranges, forming a sort of pavement. This species has scarcely any apparent fins [3].

Some, in fine, are known with pectiniform teeth on several ranges, and the Mediterranean yields one of this sort,

M. saga, Risso, 1st edit. f. 39. Remarkable for its elongated jaws, round and pointed, and its tail elongated into a very sharp point [4].

SPHAGEBRANCHUS, *Bl.*,

Differ from the murænæ principally by the apertures of their gills being approximated one to the other under the throat. The vertical fins do not begin in several of them to become salient until they approach the tail; and their muzzle is advanced and pointed. Their stomach is a long cul-de-sac, the intestine straight, and the bladder long, narrow, and placed behind.

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[1] The other species are new.

[2] *Murenophis étoilé,* Lacép., or *M. nebulosa,* Thun. Seb. II. lxix. 1.; *M. ondulé,* Lacép. V. xix. 2. (*M. catenatus,* Bl., Schn.); *M. sordida,* Cuv., Seb. II. lxix. 4.

[3] *Gymnomurène cerclée,* Lacép. V. xix. 4., or *Muræna zebra,* Shaw, Seb. II. lxx. 3.

[4] The *Nettasoma melanura,* Rafin. Caratt. pl. xvi. f. 1., is at least very much approximated to this *Murænophis saga* of Risso.

N.B. The *Dalophis,* Rafin. Caratt. pl. vii. f. 2. and 3., should be murænæ without teeth, but we are not acquainted with them.

There are some species absolutely without pectoral fins[1]. And others in which but small vestiges of them are to be seen[2].

There are even some (the APTERICHTHES, *Dumeril*, CECILIA, *Lacép.*) in which no vertical fins are perceptible, and which are consequently fishes entirely without fins[3].

MONOPTERUS, *Commers.* and *Lacép.*,

Has the two branchial orifices united under the throat in a transverse cleft, divided in its middle by a partition. The dorsal and anal appear only on the middle of the tail, and unite together at its point. There are some pectiniform teeth to the jaws and palatines, six rays to each gill, and only three very small gills.

Only one species is known, from the Sunda Isles, *Monopt. Javanensis*, Lacép., with a green back and fulvous belly[1].

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[1] *Sphagebranchus rostratus*, Bl. 419. 2., and the pretended *Leptocephale Spallanzani*, Risso 85.; *Cæcula pterygea*, Vahl. Mém. d'Hist. Nat. de Copenh. III. xiii. 1. 2. *Manti-bukaropaumu*, Russel I. 37.

[2] *Sphageb. imberbis*, Laroche, Ann. Mus. XIII. xxv. f. 18.

[3] *Muræna cæca*, Lin., Laroche, Ann. Mus. XIII. xxi. 6.

[1] I suspect that this is again the fish which Lacépède has represented, V. xvii. 3., under the name of *Unibranchaperture lisse*.

SYNBRANCHUS, *Bl.*, UNIBRANCHAPERTURI, *Lacép.*,

Are distinguished at once from the sphagebranchi by their branchiæ communicating externally only by a single hole pierced under the throat, round or longitudinal, and common to both sides. They have no pectoral fins, and their verticals are almost entirely adipose. Their head is thick, muzzle rounded, their teeth obtuse, their opercula partly cartilaginous; the rays of their gills are strong, and six in number; their intestinal canal is altogether straight, and the stomach is only distinguished from it by a little more amplitude and a valve to the pylorus. They are without cœca, and have a long and narrow air-bladder. Their habitat is in the seas of warm climates, and some of them arrive to a tolerable size[2].

ALABES, *Cuv.*,

Have, like the synbranchi, a common aperture under the throat for their gills, but they have well-marked pectorals, between which is a small concave disk. Through the skin are distinguishable a small operculum and three rays; the teeth are pointed, and the intestines as in synbranchus.

But one small species is known, from the Indian Ocean.

It is at the end of this great genus, MURÆNA, that it seems proper to us to place a fish newly discovered, and one of the most singular which is known,

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[2] *Synb. marmoratus*, Bl. 418.; *Synb. immaculatus*, Id. 419., *Unib. Cachia*, Buch. xvi. 4., *Dondoo-paum*, Russel xxxv., has no fin whatever.

SACCOPHARYNX, *Mitchill;* OPHIOGNATHUS, *Harwood*,

The trunk, susceptible of being inflated like a thick tube, is terminated by a very slender and very long tail, surrounded with a dorsal and anal very low, which unite at its point. The mouth, armed with sharp teeth, opens far behind the eyes, which are quite near the very sharp point of the muzzle. Its gills open by a hole below the pectorals, which are very small.

This fish grows to a very large size, and appears voracious. None have been observed except in the Atlantic Ocean, where they float at the surface by means of the dilatation of their throat[1].

GYMNOTUS[2], *L.*

Have, like the eels, the gills partly closed by a membrane, but this membrane opens in front of the pectoral fins. The anus is placed very forward; the anal fin extends over the greater part of the body, and most frequently as far as the end of the tail, but there is no fin along the entire back.

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[1] *Saccopharynx flagellum* of Mitchill was six feet long, the *Ophiognathus ampullaceus* of Harwood, Phil. Trans. 1827, four and a half. The first did not appear to have teeth in the lower jaw; it may be, that these two fishes, although taken in the same latitudes, are not identical in species, but they manifestly belong to the same genus.

[2] *Gymnotus*, or rather *Gymnonotus* (naked back), a name given to these fishes by Artedi.

GYMNOTUS (properly so called), *Lacépède,*

Even have no fin at the end of the tail, under which the anal fin extends.

The true GYMNOTI have the skin without perceptible scales. Their intestines, several times plicated, occupy but a moderate cavity. They have numerous cœca, and a stomach in the form of a short and obtuse sac, very much plaited internally. One of their air-bladders, cylindrical and elongated, extends very far back into a sinus of the abdominal cavity; the other oval and bilobate, of a thick substance, occupies the upper part of the abdomen on the œsophagus.

The only species with which we are acquainted are from the rivers of South America. The most celebrated is

Gymnotus electricus, L., Bl. 156., which from its form, almost all of the same thickness, and its obtuse head and tail, has received the name of *Electric eel.* It arrives to the length of five or six feet, and communicates such violent electric shocks that it knocks down men and horses; it uses this power at will, and gives it what direction it pleases, even without the necessity of contact, for it can kill fishes at a considerable distance. But this power becomes exhausted by exercise, and to recover it the animal has need of repose and nutriment. (See Humb. Obs. Zool. I. p. 49, &c.). The organ which produces these singular effects extends all along the under part of the tail, half the thickness of which it nearly occupies. It is divided into four longitudinal fasciculi, two large ones above, two small ones underneath, placed against the base of the anal fin ; each fasciculus is composed of a great number of membranous parallel laminæ, very much approaching to each other, and pretty nearly horizontal, leading on one side to the skin, and on the other to the middle vertical plane of the fish ; finally, they are united one to the other by an infinity of small vertical plates, directed transversely. The small cells, or rather the little prismatic and transverse canals, intercepted by these two orders of laminæ, are filled with a gelatinous matter, and the whole apparatus receives proportionally an abundance of nerves[1].

CARAPUS[2], *Cuv.*,

Have the body compressed and scaly, and the tail attenuated very much behind. They also live in the rivers of South America[3].

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[1] See Hunter, Phil. Trans. Vol. LXV. p. 395. Add the *Gymnotus æquilabiatus*, Humb. Obs. Zool. I. pl. x. No. 2. It would appear, according to M. de Humboldt, that this species has no posterior air-bladder.

[2] *Carapo*, the name of these fishes in Brazil, according to Marcgrave.

[3] *Gymnotus macrourus*, Bl. 157. 2. *Carapo*, Gmel. *G. brachiurus*, Bl. 157. 1.—*fasciatus*, Gmel. *G. albus*, Seb. III. pl. xxxii. f. 3.

We may, perhaps, distinguish some species with an elongated muzzle, open only at the end[1].

APTERONOTUS, *Lacép.* STERNARCHUS[2], *Schn.*,

Have the anal fin terminated before it arrives at the end of the tail, which has a particular fin; on the back is a fleshy filament, soft, couched in a furrow, hollowed as far as the end of the tail, and retained in this furrow by tendinous filaments, which leave it some liberty : a very singular organization, the use of which we have as yet been unable to divine[3]. Their head is oblong, compressed, naked, and its skin does not suffer either the opercula or the rays to be seen externally. The rest of their body is scaly. Their teeth are close and even, and scarcely perceptible on the middle of each jaw. They come from America, like the gymnoti proper, and the carapi[4].

GYMNARCHUS, *Cuv.*,

Have the body scaly and elongated, and the gills but slightly open in front of the pectorals, like the gymnoti, but their back is furnished all along with a soft, rayed fin, and there are none behind the anus, or under the tail, which is terminated in a point. Their head is conical, and naked; their mouth is small, furnished with small trenchant teeth, on a single range.

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[1] *Gymnotus rostratus*, Schn. pl. cvi.

[2] *Sternarchus*, (anus at the sternum.)

[3] I think that I have perceived that the separation is accidental, and that it is properly one of the muscles of the tail, which is easily detached, because the skin is weaker in this part.

[4] *Gymnotus albifrons*, Pall. Spic. Zool. VIII. pl. vi. f. 1. Lacép. II. vi. 146. 3.

N.B. The *Gymnotus acus*, or *fierasfer*, belongs to the *Donzelles*, and the *Gymnotus notopterus*, Pall. and Gm. *Notoptère capirat*, Lacép., to the herrings.

But one is known, from the Nile, *Gymnarchus Niloticus*, Cuv., discovered by Mr. Riffault.

LEPTOCEPHALUS, *Pennant*,

Have the cleft of the gills open in front of the pectorals, and the body compressed like a ribbon. Their head is extremely small, with a short, and rather pointed muzzle, the pectorals almost imperceptible, or actually wanting; the dorsal and anal in like manner scarcely visible, united together at the point of the tail; the intestines occupy only an extremely narrow line along the inferior edge.

One species is known which frequents our coasts and those of England, *Leptocephalus morissii*, Gm., Lacép. II. iii. 2; but there are several others in the seas of warm climates; they are all as thin as paper, and as transparent as glass, so that the skeleton is not even perceptible. A more profound study of their organization would be one of the most interesting to which travelling naturalists could devote themselves.

OPHIDIUM, *L.* DONZELLES, (*French*),

Have, like the true eels, the anus pretty far back, a dorsal and an anal fin, which unite with that of the tail to terminate the body in a point; this body, moreover, is elongated and compressed, which has caused it to be compared to a sword, and covered like that of the eels, with small scales, irregularly distributed, through the thickness of the skin. But these fishes differ from the eels by having very open gills, provided with a very apparent operculum, and a membrane with short rays. Their dorsal rays are articulated, but not branched.

OPHIDIUM, or the DONZELLES proper,

Bear, under the throat, two pairs of small barbels adhering to the point of the hyoïd bone.

There are two in the Mediterranean.

Ophidium barbatum, Bl. 59. (common donzelle). Flesh-coloured, with the dorsal and anal bordered with black. The anterior barbels shorter; at the most, eight or ten inches in length.

Oph. Vassalli, Risso, (brown donzelle). Brown; no border to the fins; the barbels equal. The stomach of these fishes is a thin oblong sac; their intestines tolerably plicated, are without cœca. Their air-bladder, oval, pretty large, and very thick, is supported by three peculiar osseous pieces, suspended under the first vertebræ, and the middle one of which is moved by some muscles proper to itself. Their flesh is agreeable.

We are acquainted with a third species from Brazil, *Oph. brevibarbe,* Cuv., brown, with shorter barbels; and there is one in the south seas very large, rose-coloured, spotted with brown. *Ophidium blacodes,* Schn. 484[1].

FIERASFER,

Want barbels, and their dorsal is so thin that it only seems a simple fold of the skin. Their natatory bladder is supported only by two osselets; that of the middle is wanting.

The Mediterranean has a species with small and close teeth, *Oph. imberbe*[2], L.

The Mediterranean also possesses another species, which has two hooked teeth in each jaw, *Oph. dentatum,* Cuv. These are both of them very small fishes.

AMMODYTES, *L.*, placed by [illegible] in the

Have the body elongated like the preceding, and are provided with one fin with articulated rays, but simple on a great portion of the back, with another behind the anus, and a third, forked at the end of the tail. But these three fins are separated by free spaces.

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[1] Add *Oph. barbatum,* Mitch. i. f. 2. which again appears to be a particular species.

[2] It is at once the *Gymnotus acus,* Gm.; and the *Notoptère fontanes,* Risso, 1st. ed. pl. iv. f. 11.

As for the *Ophidium imberbe* of the ichthyologists of the north, such as Schonefeldt, Montag., Soc. Werner. I. pl. ii. f. 2. and the *Ophidium viride,* Fab., Faun., Groënl. 148, I am not acquainted with them, but I believe that they approximate to the eels.

Finally, the *Ophidium occilatum,* Tilesius, Mém. de Petersburg, III. pl. clxxx. iii. 27. seems to me to approximate to the Gunnelli.

The muzzle of these fishes is sharp; their upper jaw susceptible of extension, and the lower one longer than the other when in a state of repose. Their stomach is pointed, and fleshy; they have neither cœca nor natatory bladder, and they remain in the sand, where they are taken when the sea retires. They live on worms which they find there.

Our coasts produce two species, a long time confounded under the common name of *Ammodytes tobianus,* L., but which have been recently distinguished[1].

Ammodytes tobianus, Bl. 75. 2. Ray. I. Synop. iii. f. 12. Which has the lower jaw more pointed, the maxillaries longer, the pedicles of the intermaxillaries very short, and in which the dorsal only commences opposite the end of the pectorals: and

Amm. lancea, Cuv., Penn. Brit. Zool. pl. xxv. f. 66. Whose maxillaries are shorter, the pedicle of the intermaxillaries longer, and the dorsal commences opposite the middle of the pectorals. It is thicker in proportion.

Both are common on all our coasts; from eight to ten inches in length; of a silvery grey. They are good eating, and are also sometimes employed as bait.

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[1] It is to *M. Lesauvage,* a skilful physician of Caen, that we are indebted for this distinction, but he has transposed the name of *Tobianus.* See Bullet. des Sc. Sept. 1824, p. 141. It will be necessary to examine whether *Ammodytes cicerellus,* Rafin., Caratt. pl. ix. f. 4. is different from *Tobianus.*

SUPPLEMENT

ON THE

FOURTH ORDER OF FISHES.

MALACOPTERYGII APODES.

IN the great genus MURÆNA we shall commence by treating of that subdivision, ANGUILLA, to which our *common eel* belongs; and to this last shall our principal attention be confined.

There are several species of the subgenus Anguilla, of which the common eel alone lives exclusively in the fresh water; the others, comparatively speaking, but imperfectly known, frequent the mouths of rivers, into the streams of which they ascend in summer.

The common eel, which sometimes has been termed *water serpent*, in consequence of its elongated cylindrical form, similar to that of snakes, varies frequently enough in its colours. It appears, according to the report of Spallanzani, that the shades of these colours depend materially on the age of the animal and the quality of the water in the midst of which the animal may live. In muddy waters the eel is brown above and yellowish underneath; in limpid waters it is of a varying green, striped with brown above, and of a silvery white underneath. Its anal fin is edged with white, and the dorsal with red.

The fins of the eel are not very apparent, and its scales are scarcely visible. The head is slender; the lower jaw advances in a point; the nostrils are projecting, and the eyes covered with a semi-transparent membrane; its lips and its two lateral lines are furnished with a great number of open glands, continually secreting an unctuous fluid, which makes its skin appear as though it were varnished, and renders it so slippery when the animal is taken into the hand.

The organization of the eel presents many remarkable facts. Its vertebræ are compressed, small, and so pliant as to permit the animal to wind itself round in all directions. The very short ribs which are attached to them form no impediment to its movements. Numerous spines disseminated among the divers fasciculi of muscles supply the strength which is wanting in the vertebræ and ribs.

Some experiments of Sept. Fontaines, related by Lacépède, prove that the eels do not grow more than about eight inches in length in the course of ten years; but if their growth is slow it takes place during a long series of years, for they can live for a century, and longer.

Agility, suppleness, size, and strength, are the inheritance of the eel. Accordingly, we find that it swims with the greatest facility; it can traverse, without the eye being able to follow it, very considerable spaces. It sometimes issues forth from the water, creeping upon the ground in the manner of the serpents, either for the purpose of seeking new waters, when those which it inhabited are dried up or corrupted, or to catch worms and insects in the meadows, and even, as is reported, to eat the peas which are newly sown, which it is said to be passionately fond of. These courses do not take place except during the night, a time when it has less risks to run, and during which a dry and warm air cannot act upon its organs.

Lacépède has well observed that one of the great causes of the death of the fishes which are taken out of the water is the desiccation which their gills undergo. But the eel can, more easily than many others, close exactly the aperture of this part and that of the mouth. Accordingly, it has been observed that it can remain six or eight days out of the water, when it is in a humid place, and the weather is not too warm; but if it be exposed to the sun, a very few moments are sufficient to cause it to perish. This has been remarked as long ago as the time of Pliny.

During the day the eels remain almost always sunk in the mud, or in holes which they have excavated in the banks, sometimes very large, and inclosing a great number of them, having almost always two apertures, by which they may enter or go out indifferently in the moment of danger, for they swim backwards almost as well as in the natural direction.

When the weather is very warm, and the water of the ponds begins to be corrupted, the eels quit the bottom, and come to the surface to respire a purer air. They then conceal themselves under the floating plants, or among those which border the shore.

This alteration of the waters is, in warm countries, one of the most frequent causes of the mortality of the eels. Spallanzani, who has made very extensive researches into their manners, relates, that sometimes hundreds of thousands of them perish in the ponds of Comachio, near Venice, ponds which produce very considerable sums solely by being let out for the fishery of these animals.

In the northern parts of Europe, where putrid fermentation proceeds more slowly, the eels are less exposed to accidents of this nature; nevertheless they sometimes contract a malady which is indicated on their skin by a great number of white spots.

Eels have been known to live sometimes for months, nay, for years, in the mud of dried up ponds, or in the holes of rivers the course of which had been turned, deprived of water, and perhaps of nutriment. This faculty renders it rarely necessary to replenish the ponds which have been fished, as a sufficient quantity of eels generally remains concealed to answer the purpose of re-stocking them as soon as the water has been restored.

The eels live on small fish, on the spawn of large ones, on insects, on carcases in a state of decomposition which have been thrown into the water, and even, as has already been mentioned, on vegetable substances. They are very voracious, and digest their prey very rapidly; accordingly, they must not be suffered to multiply too fast in ponds, if it be desired to maintain there an abundance of other fishes.

Volumes have been written respecting the mode of reproduction of the eels. Aristotle believed that they sprang from the mud; Pliny from fragments which they separated from their bodies, by rubbing them against the rocks; other ancients supposed that they sprang from the carcases of animals; Helmont believed that they came from May-dew; Schewenckfield from the gills of a cyprinus; others supposed them to come from the cod, whiting, &c. Spallanzani himself maintains that thousands of eels have been fished in the lakes of Italy, without either eggs or fœtus being found in their body, and he supposes that they procreate only in the sea, without paying attention to the fact, that a large portion of these fish never go voluntarily, and even most frequently cannot go into salt water. The truth is, that the eels couple after the manner of serpents, as has been witnessed by Rondelet; that they form eggs, which, for the most part, disclose in their belly; and that in this case they are viviparous, after the manner of the vipers.

Lacépède, in his Natural History of Fishes, quotes some observations of Sept. Fontaines, in illustration of this fact, and our countryman, Mr. Yarrell, has lately investigated the subject with his usual ability and success.

The eggs of the eels, thus growing in the body of the mother, cannot consequently be so numerous as those of most other fishes; but, as they can produce them at least from their twelfth year, and may continue to do so, as we have seen, until the hundredth, their multiplication is very considerable: accordingly, in certain waters they are more numerous than it would be possible previously to form any idea of. Spallanzani relates that they sometimes cover the bottom of the ponds of Comachio. They are scarcely less numerous in certain lakes of Southern Russia, and of that part of Turkey which borders upon it. In general, they are to be found in the warmest, as they are in the coldest countries. In these they bury themselves in the mud during winter, and remain there without eating for many months together. Their impression is sometimes to be seen in the calcareous schists, so that we may be assured that they existed in the waters of the ancient world. The eels, whose position allows them to migrate, proceed periodically from the sea into the rivers, and from these into the lakes or marshes, where they can procure food. The circumstances which accompany these emigrations, and the industrious means employed by man to turn them to profit, may be seen in the work of Spallanzani, already alluded to; but it seems that this eel of the ponds of Comachio is a different species from those of our rivers, which never go into the sea.

The eel, notwithstanding its suppleness and vivacity, which have passed into a proverb, has some enemies which it finds a difficulty in escaping from. The otters, and many aquatic birds, catch it with great skill, and feed upon it; the larger fishes, such as the pike and sturgeon, also make a prey of it.

The skin of the eels has a consistence equal to parchment, and forms the object of a small trade in great cities. The property of making the hair grow has been attributed to it when used as a fillet; in Tartary it is employed, after having been oiled, as a substitute for glass in windows.

It is pretended that it is possible to tame eels so as to make them eat from the hand, and that they are sensible to music and agreeable odours.

The name of CONGER was at first given to a species of eel, the *Murœna conger*, after Aristotle and Athenæus, who had called the sea-eel κογτρος. M. Cuvier has withdrawn this fish from the genus anguilla, and made it the foundation of a subgenus, under the name of conger.

Several species are known.

The dimensions of the *common conger* are superior to those of the eel. It is ordinarily six or seven feet long, sometimes ten or twelve, or even eighteen, according to Gesner.

It is found in the seas of Europe, of Northern Asia, and in those of America as far as the Antilles. It is very abundant on the coasts of England and France, in the Mediterranean Sea, where it was much sought after by the ancients, and in the Propontis, where it was not long ago in considerable estimation. Those of Sicyon were more especially esteemed.

The congers are extremely voracious. They live on fish, mollusca, and crustacea; they do not even spare their own species. They are extremely fond of carrion, and are sure to be found in those places into which the carcases of animals have been thrown. They usually remain in ambuscade at the mouths of great rivers, to seize the fish which are ascending or descending the stream. They twist themselves round them, after the manner of serpents; they appear to enclose them, as it were in a net, and from this peculiarity is derived the name of *filat*, which they receive in some ports of the Mediterranean Sea.

The congers themselves are exposed to a multitude of enemies. They are pursued with ardour and perseverance by man; they are taken with the line, or with the same nets as the eels: the lines should be three or four hundred feet in length, charged with lead at one of their extremities, and provided each with twenty-five or thirty small cords with hooks and baits. They are so numerous in the Severn, that in the interval from one tide to another a single fisherman, with a small hair net, which he puts into the holes where any water has remained, may catch a bushel of young ones, particularly in the month of April. In Sardinia they are caught with nets which are sunk very deep into the sea. The large individuals defend themselves for a long time; and if they find a body around which they can twist their tail they will sooner suffer their jaw to be plucked away than let go. They possess great tenacity of life.

We are assured that the gigantic lobsters called palinuri fight the conger with great advantage, tearing open its belly with their claws. The murenophides likewise devour them, and it is not rare to see congers mutilated by them. We are informed that the tail of the conger can be re-produced.

The flesh of this fish is white and well-flavoured, but as it is very fat it does not agree with all stomachs.

The ancients, Oppian in particular, have asserted that it couples after the manner of serpents. It is more than probable that it is ovo-viviparous, but it does not appear that we have as yet any positive proof of this.

In many places the conger eels are dried for exportation. For this purpose they are cut open in their under part through their entire length, the intestines are removed, deep scarifications are made upon the back, the parts are kept separate by means of small sticks, and they are suspended by the tail to poles or the branches of trees. When they are perfectly dry they are collected in packets, each weighing about two hundred pounds.

Redi has found, in several congers which he has dissected, some species of hydatids nine or ten inches in length, situated on the coats of the stomach, the liver, the muscles, the ovaries, and other parts.

The *conger niger* lives in the rocks of the sea of Nice, and attains the weight of forty pounds. Its flesh is much superior to that of the common conger. The epithet by which it is designated is owing to its colour, which is entirely black.

There are some other species of this subgenus, but their flesh is considered as of a very inferior quality, and they are distinguished by no peculiarity deserving of attention.

Among the species of the subgenus MURÆNA (proper) we shall notice,

The *common muræna*, *Muræna helena*. This fish is about three feet long, and sometimes more; it weighs as much as twenty or thirty pounds; is very much extended in the Mediterranean, and the ancient Romans, who were well acquainted with it, held it in high estimation, under the name of *muræna*. It is also to be found in the other warm or temperate seas of Europe and America, and more particularly than elsewhere on the coasts of Sardinia.

During winter this fish retires to the bottom of the water; but in all seasons it is fond of lodging in the cavities of rocks, frequenting the coasts only in spring.

Its air-bladder is small, ovoïd, and placed towards the upper part of the abdomen. Its stomach is a short sac, where it accumulates incessantly a multitude of crustacea, fishes, and mollusca, but particularly octopi, sepiæ, and soft zoophytes. It is so voracious, that when it fails of other food it gnaws the tails of other individuals of its own species. It is ovo-viviparous, and couples after the manner of the vipers.

It is able not only to live habitually in fresh water, but also to resist the action of the atmospheric air for many days after it has been drawn out of the water.

Its flesh, white, fat, and very delicate, is very agreeable eating, and would be still more so were it not filled with a number of short and curved bones.

The Murænæ, which are extremely cunning, are fished for with wheels and fathom-lines. They were carefully reared in vivaria by the Romans. As early as the time of Cæsar the multiplication of these domestic murænæ was so great, that on the occasion of one of his triumphs, that great general presented six thousand of them to his friends. Licinius Crassus reared them so as to be obedient to his voice, and to come and receive their food from his hands; while the celebrated orator Quintus Hortensius wept over the loss of those of which death had deprived him.

In all cases the bite of these fishes is severe, and often dangerous.

The *muræna grisea* has been described by Commerson: it lives in the midst of the rocks detached from the shore which environ New Britain and the neighbouring islands. The effect of its bite is said to be similar to the cut of a razor.

There is another species, *Pantherina*, which occupies the same habitat, and whose bites are not less painful and dangerous.

We shall conclude our remarks on this order with some observations on the very remarkable genus GYMNOTUS.

It is impossible to survey any part of nature, animate or inanimate, with the eye of a philosopher, without receiving unequivocal demonstration of that combined wisdom and power by which all things have been formed. To the reflecting mind, the simple blade of grass, the commonest shell which is cast upon the sea-shore, present ample materials for meditation and wonder. In general, however, the objects by which we are daily environed cease to impress us thus, in consequence of their familiarity; but when we are transported either in person or in thought to other regions, where nature manifests herself in a series of new phenomena, their contemplation re-awakens our slumbering sense of admiration, and raises our thoughts to the infinite and mysterious source of all the varieties of existence. There is scarcely anything in nature more calculated to produce such a frame of mind than the consideration of the extraordinary electrical powers possessed by certain animals.

The *Gymnotus electricus* attains the length of three feet, or three feet and a half, and the circumference of its body in the thickest part, is about fourteen or fifteen inches; individuals have been seen of five or six feet in length. The head is full of little holes, or very perceptible pores, which are the orifices of vessels intended to shed over its surface a viscous humour. Smaller, but analogous apertures are very numerously spread over the body and tail, and secrete this gluey matter in such abundance, that when these electric eels are preserved (as is done at Surinam) in broad troughs, where they are fed with worms and small fish, it is necessary to change the water nearly every day.

The general colour of this animal is blackish, with some long and narrow stripes of a deeper shade. This colour varies according to age and other circumstances. All those observed by the Baron Humboldt were of rather a deep olive green. The tail is much longer than the entire of the head and body; the muscles which move it are extremely powerful, and the animal whirls it about with astonishing agility. The elements of strength, massiveness, and velocity are combined in this organ.

The electric gymnotus, from its very long, cylindrical, and serpent-like body, resembles an eel of about five or six feet long. It is not, however, as has been seen in the text, of the same genus as the eel, but forms a genus of itself, belonging to the same family. It inhabits the bosom of those immense rivers which flow towards the eastern limits of South America, in regions which, though situated within the torrid zone, are yet continually moistened by the influx of the sea, or the overflowing of innumerable streams. There the earth is prodigal of poisonous plants and pernicious animals, the impure inhabitants of the inundated savannahs. Accordingly, though in Surinam, in French Guiana, and in Peru, this fish bears the name of eel, it strongly partakes of the nature of the climate under which it is destined to exist. From afar, it attacks and oversets both men and even the most vigorous and most agile horses. It is the more redoubtable from its very energetic organs of motion, which, in an instant transport it to its prey, or remove it from its enemies, and it is thus enabled to make the most of its electric power, and to spread death or stupor around it, as it were, with a single shock. More terrible than the torpedo, it ceases to be an object of fear, only with the cessation of its existence.

The electric eel is very common in the small streams and the pools, which are found here and there in the immense and generally arid plains which separate the eastern bank of the Orinoco from the Cordillera of the coast of Venezuela.

There is an immense quantity of these fish in the environs of the little town of Calabozo; and near Uritucu, a route, formerly very much frequented, has been abandoned in consequence of them. It was necessary, in going this road, to ford a stream, in which a number of mules were annually drowned, being stunned by the electric shocks emitted by these animals.

The torporific faculty of this eel, or, to speak with more propriety, electric gymnotus, which Muschenbroëk and Priestly have confounded with the torpedo, had been observed at Cayenne as long ago as 1671, by the naturalist and astronomer Richer; but it was not until long after that period that philosophers and medical men attempted to penetrate into the causes of the phenomenon. La Condamine and several others threw some light upon the subject; and about 1773, Williamson at Philadelphia, Garden in Carolina, Walsh and Pringle in London, investigated the source and nature of this astonishing power; but it is more especially to Baron Humboldt that we are indebted for the most interesting and valuable details concerning this extraordinary animal, which, we may remark, by the way, has been twice brought alive into Europe.

If the electric eel be touched with one hand, no commotion is felt, or at least the shock is extremely feeble, whereas it becomes extremely violent when both hands are applied at a tolerable distance from each other. We find here an action precisely analogous to that which is produced by the electric battery.

According to M. de Humboldt, the commotions which he received from the gymnotus, surpassed in strength the most painful electrical shocks which he ever remembers to have received from a large Leyden phial completely charged. He, therefore, thinks that there was no exaggeration in the account of the Indians, who assured him that swimmers are frequently drowned when attacked by one of these animals in the leg or arm. A discharge so violent, he says, is fully capable of depriving a man, for many minutes, of the use of his limbs. Having placed his two feet on a gymnotus which had just been brought out of the water, he received a most terrific shock, and felt for the rest of the day, a very severe pain in the knees, and almost in all the articulations of the body.

Metals, water, moistened bodies, &c., are conductors of the electric powers of the gymnotus, and this explains how a person may be attacked by it in the middle of the waves, though at a considerable distance from the animal, and how, at about fifteen feet off, the smaller fish are immediately struck with death.

As is the case with the torpedo, the sort of segment of a circle which is formed by the two hands, may be very much enlarged without any sensible diminution in the force of the commotion. Twenty-seven persons holding each other by the hands, and composing a chain, the two ends of which were in contact with to two points on the surface of the fish's body, felt a very smart shock simultaneously.

It depends upon the will of the animal to produce commotions more or less strong. It is often even necessary that it should be, as it it were, progressively roused and animated. In general the first shocks are more feeble; they become stronger and stronger, in proportion as the irritation and agitation of the animal increases. Finally, they are terrible, as observers remark, when the gymnotus is worked up to a pitch of rage.

When the fish has thus emitted reiterated shocks around, it appears to be exhausted, and a repose is necessary for the renewal of its power. One would think that this time was employed to recharge its fulminating organs with a fresh supply of the torporific fluid. "In America," says M. de Humboldt, "they take advantage of this interval to catch these fish with but little risk. They force wild horses to enter the ponds inhabited by the electric eels. These unfortunate quadrupeds receive the first discharges; stunned and overthrown, they disappear under the water, and the fishermen take possession of their assailants, either with nets or with the harpoon. The combat is finished in about a quarter of an hour."

The Indians assured M. de Humboldt, that on putting horses two days in succession into a pool full of these electric eels, no horse was killed on the second day. This is another proof of the necessity of repose to enable these fish to accumulate a new quantity of the electric fluid.

A phenomenon extremely worthy of attention, presented by the same fish, is the following: we are assured that some negroes, and certain aborigines of the country in which it is found, enjoy the privilege of touching it without feeling the influence of its action. We are ignorant whether this exemption proceeds from compressing the animal strongly by the back, as some persons affirm, or from interposing between the hands and the body of the fish, some substance which is a non-conductor of electricity, or by employing some other trick, which it is their interest to pass off as a supernatural faculty; but it is stated positively, that women afflicted with nervous fevers, have been able to handle it without any inconvenience. Henry Collins Flagg has seen a woman affected with one of those maladies, interrupt a chain which was prepared for the passage of the electric current from the animal.

The shocks produced by the gymnotus are accompanied with sparks altogether similar to those produced in electrical operations. They were seen for the first time, in London, by Walsh, Pringle, and Magellan. The first of these observers found it sufficient to obtain them, to compose a part of the chain with two plates of metal isolated on a square of glass, and sufficiently near each other to leave between them but a very small interval The light was then easily distinguished when the experiment was made in a chamber into which day-light could not penetrate. Several other experiments have also proved the identity of this fluid of the gymnotus with electricity.

Above the natatory bladder, which in this fish extends to the interior of the tail, and is lengthened almost from the head to the extremity of the body, is found an apparatus astonishing both for its bulk and its structure, and which it is impossible not to recognize as the electric organ. The gymnotus has four of these organs, two large, and two small, extending on each side of the body from the abdomen to the end of the tail, the first above and the second below, and placed against the base of the anal fin. These four organs are sorts of bundles, and their bulk is so considerable that it forms perhaps one-third of the entire fish. The two large ones are so wide as to be separated one from the other towards the top only by the dorsal muscles, towards the middle of the body, by the natatory or swimming bladder, and towards the bottom by a partition, with which they intimately unite, while they are attached by a loose but very strong cellular membrane to the other parts which they touch. The small lower bundles are separated from the two large upper ones by a longitudinal and almost horizontal membrane. Each of these four bundles is composed of a great number of tendinous expansions, long, parallel, horizontal, and separated from each other by about the twentieth part of an inch. Hunter reckoned thirty-four in one of the large bundles, and fourteen only in a small one. Other vertical plates or expansions of the same nature, but much more numerous, cut the preceding almost at right angles; this forms a wide and deep net-work composed of a multiplicity of small cells. Hunter reckoned two hundred and forty of these vertical plates in a length of about eleven lines. The interior of the cells is filled with an unctuous, and as it were gelatinous kind of substance.

This apparatus, which, like that of the torpedo, is altogether analogous to the Voltaïc pile, is put in play by a system of nerves emanating from the vertebral or spinal marrow, composed of as many trunks as there are vertebræ, and it receives, besides, some branches of a large nerve, running in a straight line from the cranium to the extremity of the tail, above the back-bone. All the ramifications of these various nerves are spread out in the cells of the electric organs, and thus become so many instruments capable of striking with death or torpor all the animals within reach of their influence.

M. de Lacépède has compared the composition of these organs to a battery composed of a multitude of electric pieces, or a numerous series of small fulminating squares or plates. As the force of a battery of this kind is estimated by the extent of the surface of the squares or plates which form it, he calculated what might be the measurement of all the united surfaces of the vertical and horizontal membranes in the four torporific organs of a gymnotus four feet long, and found it to be at least one hundred and twenty-three square feet. The two organs in the torpedo are only fifty-eight. When we recollect the terrible effects produced by plates whose surface is but a few feet square, we shall not be surprised that an animal which possesses, and can use at will an electric instrument of a hundred and twenty-three square feet of surface can produce such astounding shocks as we have now described.

We shall conclude with a few brief extracts from M. de Humboldt respecting the mode of taking these fish.

"Having remained for three days to no purpose in the town of Calabozo, and received but a single living eel, and that rather weak, we resolved to proceed to the banks of those pools in which the gymnoti abound, and make our experiments in the open air. We first came to a small village named *Rastro de Abaxo.* The Indians conducted us thence to Caño de Bera, a reservoir of miry and stagnant water, but surrounded with rich vegetation. We were greatly surprised when they informed us that they were going to catch about thirty half-wild horses in the neighbouring savannahs, to employ them in fishing for these electric eels. The idea of this sort of fishing, which they call *embarbascar concaballos*[1], is singular enough. The word barbasco designates the roots of any poisonous plant, by the contact of which a great mass of water receives in an instant the property of killing, or at least of intoxicating and benumbing the fish. These come to the surface of the water when they have been poisoned by this means. As the horses, driven here and there, through a pond or pool, produce the same effect upon the alarmed fishes, the Indians, confounding cause and effect, apply the same denomination to the two kinds of fishery.

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[1] To make drunk by means of horses.

" While our host was explaining to us this strange system of fishing, a troop of horses and mules arrived. The Indians had made a sort of enclosure around them, and pressing them closely on all sides, forced them to enter the water. I shall but imperfectly depict the interesting spectacle presented to our view by the combat of the eels against the horses. The Indians, provided with very long reeds and harpoons, placed themselves around the basin. Some of them mounted upon trees, whose branches overhung the surface of the water. They all prevented, by their cries and the length of their reeds, the horses from attaining the shore. The eels, stunned and confused by the noise of the horses, defended themselves by the reiterated discharge of their electric batteries. For a long time they seemed likely to gain the victory over the horses and mules ; these were seen in every direction, stunned by the frequency and force of the electric shocks, to disappear under the water. Some horses, however, rose again, and in spite of the active vigilance of the Indians, gained the shore exhausted with fatigue ; and their limbs being benumbed by the electric commotions, they stretched themselves at full length upon the ground.

" I could have wished that a skilful painter had had the opportunity of seizing the moment when the scene was most animated. The groups of Indians surrounding the basin ; the horses with their manes bristling, terror and anguish depicted in their eyes, trying to escape the storm which surprises them ; the yellowish and livid eels, which, like huge aquatic serpents, are swimming on the surface of the water, and pursuing their enemy; all these objects presented without doubt the most picturesque assemblage imaginable. I remember the superb picture of a horse entering a cavern, and frighted at the view of a lion. The expression of terror is not stronger there, than what we witnessed in this unequal contest.

"In less than five minutes two horses were already drowned. The eel, more than five feet long, glides under the belly of the horse or mule; it then make a discharge from the entire extent of its electric organ. It attacks at once the heart, the viscera, and particularly the *plexus* of the gastric nerves. It is not, therefore, surprising that the effect it produces on a large quadruped should exceed that produced upon a man whom it touches only at one of his extremities. I have my doubts, however, whether the gymnotus kills the horses immediately. I rather believe that the latter, stunned by the reiteration of the electric shocks, fall into a profound lethargy. Deprived of all sensiblity they disappear under the water; the other horses and mules pass over their body, and they perish in a few minutes. After this commencement I was afraid that the sport might terminate very tragically: I did not doubt but that by degrees the greater part of the mules would have been drowned. Eight francs is paid for each of them, if the master happens to be known. But the Indians assured us that the fishing would soon be at an end, and that nothing is to be dreaded but the first assault of the gymnotus. In fact, whether the galvanic electricity is accumulated in repose, or the electric organ ceases to perform its functions, when fatigued by too long use, the eels after a certain time resemble discharged batteries. Their muscular motion is still equally active, but they have no longer the power of giving energetic shocks. When the combat had lasted a quarter of an hour, the mules and horses appeared less affrighted; they no longer bristled up their mane, and the eye was less expressive of suffering and of fear. They were no longer seen to fall backwards; and the eels swimming with the body half out of the water, and now flying from the horses instead of attacking them, began themselves, in their turn, to approach the shore."

The temperature of the water in which these eels were found, is 26°. of the centigrade thermometer. M. de Humboldt believes that the feeble state of the individuals brought to Europe alive, and the short duration of their existence, was owing to the coldness of the water in which they were preserved. It was supposed that the load-stone could deprive these animals of their electric power, but this is a mistake. The gymnotus, though so formidable from the peculiar means of defence afforded it by the Author of nature, is by no means a fierce or voracious animal.

All the fishes of which we have hitherto spoken, not only have the skeleton osseous or fibrous, and the jaws complete and free, but their gills are constantly in the form of laminæ, or combs (laminiform and pectiniform).

THE

FIFTH ORDER OF FISHES,

THE LOPHOBRANCHII

Has also the jaws complete and free, but it is amply distinguished by the gills, which, instead of being as usual, pectiniform, are divided into little round tufts, disposed in pairs along the branchial arches, a structure of which no other fish has yet presented any example. They are enclosed under a large operculum, attached on all parts by a membrane, which only leaves a little hole for the passage of the water, and exhibits, in its thickness, only some vestiges of rays. These fishes may also be recognized by having their body cuirassed from one extremity to the other, with pieces which render it almost always angular. They are generally of small size, and almost without flesh. Their intestine is equal and without cœca; their natatory bladder small but tolerably large in proportion.

SYNGNATHUS[1], *L.*,

Form a numerous genus, whose character consists in a tubular muzzle, formed, like that of the *Fistularidæ*, by the elongation of the ethmoïd, of the vomer, of the tympanic bones, of the preopercula, of the subopercula, &c., and terminated by an ordinary mouth, but cleft almost vertically on its extremity. The aperture for respiration is towards the nape; they want the ventrals. Their generative system has this peculiarity: the eggs slip into, and disclose the young in a pouch formed by a turgescence of the skin, under the belly in some, in others under the base of the tail, and which is cleft to allow the little ones to come forth.

SYNGNATHUS, (properly so called),

Have the body very much elongated, very thin, and its diameter varies but little through the entire length. Several species are found in all our seas.

There are some, which, beside their pectorals, have a dorsal, a caudal, and an anal[2].

Others want the anal only[3].

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[1] From σὺν and γνάθος, (jaws united), a name composed by Artedi, who believed the tube of the muzzle of these fishes to be formed by the union of their jaws.

[2] *Syngnathus typhle*, L., Bl., 91. 1. *Syng. acus*, L., Bl. 91. 2.

[3] *Syng. pelagicus*, Risso, p. 63. *Syng. Rondeletii*, Laroche, Ann. Mus. XIII. 5. 5; *viridis*, Risso, 65; Rondelet, 229. 1. *S. barbarus*, Pennant, Brit. Zool., or *rubescens*, Risso.

The pouch for the eggs in both these groups is under the tail.

Others are destitute of anal and pectorals, but have a dorsal and a caudal. They have their egg-pouch under the belly [1].

Some, in fine, have no other fin than the dorsal [2].

HIPPOCAMPUS, *Cuv.* (The *Sea-horse.*)

Have the trunk compressed laterally, and considerably more elevated than the tail. When curved, after death, this trunk and the head have some resemblance to the bust of a horse in miniature. The joinings of the scales are raised into crests, and their salient angles into spines. Their tail has no fins.

A species is found in our seas with a shorter muzzle, *Hipp. brevirostris*, C., Will. I. xxv. f. 3 ; and another with longer muzzle, *Hipp. guttulatus*, C., Will. I. xxv. f. 5. both of which have only some filaments on the muzzle and body. There are also some approximating species in both Indies [3].

New Holland produces a larger one and very remarkable for the leaf-like appendages which adorn divers parts of its body, *Syng. foliatus*, Shaw, Gen., Zool. V. ii. pl. clxxx. Lacép., Annales du Mus. IV. pl. lviii. f. 3.

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[1] *Syng. æquoreus*, L., Montagu, Soc. Wern. I. 4. f. 1.

[2] *Syng. ophidion*, L., Bl. 91. 3. *Syn. papacinus*, Risso, IV. 7. *Syng. fasciatas*, Id. ib. 8.

[3] *Syng. longirostris*, C., Will. I. 25. f. 4. and other species, which we shall publish in our great work on Ichthyology.

SOLENOSTOMA[1], *Seb.* and *Lacép.*,

Differ principally from the syngnathi in having large ventrals behind the pectorals, united together, and to the trunk, so as to form a kind of apron, which serves to retain the eggs, like the pouch of the syngnathi. They have also a dorsal with five rays, but elevated, and situated near the nape. Another very small, on the origin of the tail, and a large pointed caudal. In other respects, they greatly resemble hippocampus.

But one species is known, from the Indian Seas, *Fistularia paradoxa*, Pall., Spic. VIII. iv. 6.

PEGASUS, *L.*,

Have a salient muzzle formed of the same pieces as the preceding, but the mouth, instead of being at its extremity, is under its base. It reminds us a little of that of the sturgeon by its protractility, but it is composed of the same bones as in ordinary fishes. The body of these pegasi is cuirassed, as in hippocampus and solenostoma; but their trunk is broad, depressed, the aperture of the gills is on the side, and there are two distinct ventrals behind the pectorals, which are often large, and have given rise to the name of the genus. The dorsal and anal are opposite one another. The intestine being lodged in a broader and shorter cavity than in the syngnathi, makes two or three folds.

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[1] *Solenostoma*, (funnel-mouthed) from σωλὴν, a tube, and στόμα, mouth.

Some species are to be found in the Indian Ocean [1].

After these five orders of osseous or fibrous fishes, with complete and free jaws, we pass to the sixth order of fishes.

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[1] *Pegasus draco*, L., Bl. 209. *Pegas, natans*, Bl. 121. *Peg. volans*, L. *P. laternarius*, C., with a muzzle furnished with six longitudinal ranges of dentations.

THE

SIXTH ORDER OF FISHES.

THE PLECTOGNATHI,

May be approximated to the chondropterygii, to which they are allied a little in the imperfection of the jaws, and in the slowness with which their skeleton hardens; nevertheless, this skeleton is fibrous, and its entire general structure is that of ordinary fishes. Their principal distinctive character consists in the maxillary bone being soldered or fixedly attached on the side of the intermaxillary, which alone forms the jaw, and to which the palatine arch is dovetailed by a suture with the cranium, and consequently has no power of motion. The opercula, moreover, and the rays, are concealed under a thick skin, which only permits a small branchial cleft to be visible externally[1].

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[1] This disposition, the commencement of which is already observable in the chironectes, has caused many naturalists to believe that the plectognathi wanted opercula and rays: they possess them like other fishes.

But very small vestiges of ribs are to be found. The true ventrals are wanting. The intestinal canal is ample, but without cœca[1]; and almost all these fishes have a considerable natatory bladder.

This order comprehends two very natural families, characterized by the manner in which their jaws are armed, the GYMNODONTES and SCLERODERMES.

The first family, or the

GYMNODONTES,

Has, instead of apparent teeth, the jaws furnished with an ivory substance, divided internally into laminæ, the general appearance of which somewhat resembles the bill of a parrot, and which is essentially composed of true teeth, united together, and succeeding one another in proportion as there are any worn out by the effect of trituration. (See my Lessons on Comp. Anat. tom. iii. p. 125.) Their opercula are small; their rays are five in number on each side, and both are very much concealed. They live on crustacea and fuci; their flesh is generally mucous and not much esteemed. Several of them are considered poisonous, at least in certain seasons.

Two of their genera, *Tetrodon* and *Diodon*, commonly called *balloon-fish* and *globe-fish*, are capable of inflating themselves like balloons, by swallowing the air, and filling their stomach with that fluid, or rather filling a sort of crop, very thin, and very extensible, which occupies the whole length of the abdomen, adhering intimately to the peritoneum, which has caused it to be sometimes taken for the peritoneum itself, sometimes for a sort of epiploon. When they are thus inflated, they turn on their backs; the belly is uppermost, and they float on the surface of the water, without being capable of directing themselves. But this constitutes for them a means of defence, because the spines with which their skin is furnished are then raised on all sides[1]. They have, moreover, an air-bladder with two lobes; their kidneys, situated very high, have been erroneously taken for lungs[2]. They have but three gills on each side[3]. They utter, when they are taken, a sound, which is certainly caused by the air which issues from their stomach. Their nostrils are furnished each with a double fleshy tentaculum.

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[1] Bloch erroneously attributes cœca to the genus diodon.

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[1] See Geoffroy St. Hilaire, Desc. des Poissons d'Egypte, in the great work on Egypt. There are also analogous dispositions in the chironectes.

[2] It is thus that I think I can explain the error of Schœpf. Ecrits. des Nat. de Berlin, viii. 190, and that of Plumier, Schn. 513, and without doubt, also that of Garden., Lin. Syst. ed. XII. i. p. 348, *in notis*. As for the cellular organs of which Broussonet speaks, Ac. des Soc. 1780, last page, there is nothing which can give rise to such a supposition. It is certain that these fishes differ in no respect from others in the mode of respiration.

[3] We have already had an example of this number in *Lophius*.

DIODON, *L.*, (Vulg. *Spiny globe-fish.*)

Are thus named, because their jaws being undivided, present but one piece above, and one below. Behind the trenchant edge of each is a round part, furrowed cross-wise, which forms a powerful instrument of mastication. Their skin is armed on all sides with thick pointed prickles, so that when they are inflated, they resemble the fruit of a horse-chesnut[1].

There is a considerable number of their species in the seas of warm climates.

Some have the prickles long, supported by two lateral roots.

The most common of this group, *Diod. atinga*, Bl. 125. and better, Seba. III. xxiii. 1, 2, attains to more than a foot in diameter[2].

Others have short prickles on three divergent roots[3].

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[1] The jaws of this genus are not uncommon among petrifactions.

[2] *Diod. histrix.* Bl. 126, is the same species not inflated. I name it to avoid all equivoque, *Diodon punctatus.* Add *Diod. spinosissimus*, Cuv., Mém. Mus. iv. p. 134 ; Seb. III. xxiv. 10. *Diod. tricdricus*, Cuv., Mém. Mus. iv. p. 133 ; Seb. II. xxiii. 4. *D. nictemerus*, Cuv., Loc. Cit. IV. vii. 5. *D. novem-maculatus*, Id. ib. vi. 3. D. *sex-maculatus*, Id. ib. vii. 1. *D. multimaculatus*, Id. ib. 4.

[3] *Diod. tigrinus*, Cuv., Mém. Mus. IV. vi. 1 ; or *orbiculatus*, Bl. 127 ; Seb. III. xxiii. 3. *D. rivulatus*, Cuv., ib. 2 ; or *Maculato-striatus*, Mitchill, vi. 3 ; probably the *Orbe*, Lacép. I. xxiv. 3. *D. jaculiferus*, Cuv., loc. cit. vii. 3. *D. antennatus*, Id. ib. 2.

Others, in fine, have slender prickles, like pins, or hairs[1].

TETRAODON, *L.*,

Have the jaws divided in their middle by a suture, so as to present the appearance of four teeth, two above, two underneath. Their skin is furnished only with small spines, not very prominent. Several species are considered to be venomous.

The most anciently known is that of the Nile.

Tetraodon lineatus, L., *Tet. physa*, Geoff., Poiss. d'Egypte, i. 1; Rondel. 419. (FAHACA of the Arabs, *Flasco psaro* of the Greeks, &c.) With back and flanks striped longitudinally with brown and whitish. The Nile throws out many of them on land during the inundations, and they serve then as playthings for the children.

Some have the body compressed laterally, and the back a little trenchant. These seem likely to be less susceptible of inflation than the others: one of them is electrical[2].

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[1] *Diod. pilosus*, Mitchill, fishes of New York, I. 471.

[2] The head and tail of the tetraodons are generally smooth, but the rest of their body may be rendered more or less rough, by means of the very small spines which issue from their skin. The various combinations of the smooth and rough parts, and the configurations which result from the more or less oblong forms of the head, have allowed us to arrange them as follows:

I. Species with short head, susceptible of inflation in a globular form.

1st. With the body rough throughout.

I separate from the tetraodons, and even from all the species susceptible of inflation,

A. Without spots: *Tetr. immaculatus*, Lacép. I. xxiv. 1.; Russ. I. 26.

B. With black spots: *Tetr. moucheté*, Lacép. I. xxv. 1; or *T. Commersonii*, Schn., Russell, i. 28. *Tet. fluviatilis*, Buchan. xxx. 1. *Tetr. geometricus*, Bl., Schn., Catesb. II. xxviii.

C. With black bands: *Tetr. fahaca*, or *T. physa*, Geoffr., d'Eg., Poiss. I. 1. *T. lineatus*, Bl. 141, with which *Tetr. psittatus*, Bl., Schn. 95, is at least very near allied.

D. With pale spots: *Tetr. testudineus*, Bl., 139, of which *T. reticularis*, Bl., Schn. appears to be a variety. *T. hispidus*, Lacép. I. xxiv. 2, and Geoffr., Eg., Poiss. I. 2. *T. patoca*, Buch. xviii. 2.

2d. With body smooth throughout: *T. lævissimus*, Bl., Schn. *T. cutcutia*, Buchan. xiii. 3.

3d. With the flanks only smooth, and with lateral tentacula: *T. Spengleri*, Bl. 144; Seb. III. xxiii. 7 and 8, which is the same as the *Tet. Plumieri*, given after Plumier, Lacép. I. xx. 3.

N.B. What Lacépède has taken for a hump is only the pectoral of the other side, the point of which is visible; and the *Spheroïde tuberculé*, established by Lacépède, ii. 1, is derived from the same plate of Plumier, and represents the same fish in a face view. Schneider had already taken notice of this, Bl., Schn. Ind. pl. vii. *T. honkennii*, Bl. 143.

4th. With smooth flanks; without lateral tubercles: *T. ocellatus*, Bl. 145. *T. turgidus*, Mitch. pl. vi. f. 5. *T. lunaris*, Russ. i. 29.

II. With oblong head.

1st. With the flanks only smooth: *T. argentatus*, Lacép., Ann. Mus. IV. xiii.

2d. With back and flanks smooth; the belly alone rough: *T. lagocephalus*, Bl. 143; and Seb. III. xxiii. 5 and 6. *T. lævigatus*, Will. pl. i. 2.

III. With carinated back: *T. rostratus*, Bl. 146. 2, to which

ORTHAGORISCUS, *Schn.* CEPHALUS, *Sh.*, (Vulg. *Sun-fish, Moon-fish.*)

Which have the jaws undivided, like the diodons, but whose body, compressed, and without spines, is not susceptible of inflation, and whose tail is so short, and so high vertically, that they have the appearance of fishes from which the posterior part has been cut away, which gives them a very extraordinary figure, and one very sufficient for the purpose of their distinction. Their dorsal and anal, each high and pointed, are united to the caudal. They want the natatory bladder; their stomach is small, and immediately receives the biliary canal. Under their skin is a thick stratum of gelatinous substance.

In our seas a species is found sometimes more than four feet long, and weighing more than three hundred pounds. The skin is very rough, and of a fine silvery colour, *Tetraodon mola*, L., Bl. 128 [1].

Tetr. electricus, Paters. Phil. Trans. vol. lxxvi. pl. iii. is at least very closely allied. *T. Gronovii.*

[1] Add *Orth. oblongus*, Schn. 97. *Orth. varius*, Lacép. I. xxii. 2. *Orth. hispidus*, Nov. Comm. Petrop. X. viii. 2 and 3.

N.B. The *Ovoïde fascé*, Lacép. I. xxiv. 2. *Ovum Commersonii*, Schn. 108, has been described and represented by Commerson after a stuffed individual, which he himself suspected to be a mutilated *Tetraodon*, and which, in fact, is only a *Tetraodon lineatus* which has lost its fins.

The *Sphéroïde tuberculé* has been given, as we have said, after a drawing of Plumier, which only represents a *Tetraodon* in a face view, and the vertical fins of which cannot be seen, Conf. Schn. index lvii.

Thus these two genera should be suppressed.

There is at the Cape an oblong species, *Orthagoriscus oblongus,* Bl., Schn. 97. the skin of which is hard, and divided into small angular compartments.

A third species has sometimes been taken in the Ocean, very small, and which has some spines, *Orth. spinosus,* Bl., Schn. *Diodon mola,* Pall. Spic. Zool. pl. iv. f., and better Kœlr., Nov. Comm. Petrop. x. pl. viii. f. 3.

We shall also make a particular genus of the

TRIODON,

Fishes whose upper jaw is divided as in tetraodon, and the lower simple, as in diodon. An enormous dewlap, *(fanon,)* almost as long as the body, and twice as high, is supported in front by a very large bone which represents the pelvis, and approximates them to certain of the Balistes. Their fins are the same as in diodon; their body is rough, as in tetraodon, and the surface of their dewlap bristles with a great number of small rough crests placed obliquely.

But one species is known, from the Indian Ocean, discovered by M. Reinwardt, *Triodon bursarius,* Reinw., *Triod. macroptère,* Less. and Garn. Voy. de Duperrey, Poiss. No. 4.

The second family of the PLECTOGNATHI, or that of

SCLERODERMES,

Is easily distinguished by the conical or pyramidal muzzle prolonged from the eyes, and terminated by a small mouth, armed with distinct teeth, few in number, to each jaw; their skin is generally rough or clothed with hard scales. Their natatory bladder, oval, large, and robust.

BALISTES, *L.*,

Have the body compressed; eight teeth on a single range in each jaw; most frequently trenchant; the skin scaly, or grained, but not absolutely osseous. There is a first dorsal composed of one or several prickles, articulated on a particular bone, which attaches to the cranium, and presents a furrow into which the prickles may be withdrawn; there is also a second dorsal, soft, and long, and placed opposite an anal pretty nearly similar. Although they have no ventrals, we observe in their skeleton a true pelvic bone suspended to the bones of the shoulder.

These fishes are found in great numbers in the torrid zone, near rocks, on a level with the water, where they shine, like the chætodons, with brilliant colours. Their flesh, generally but little esteemed, is said to become dangerous during the season in which they feed upon the coral polypi. I have found nothing but fucus in those which I have opened[1].

BALISTES, (properly so called),

Have the entire body clothed with large scales, very hard and rhomboidal, and which, not encroaching one upon the other, have the appearance of compartments of the skin. Their first dorsal has three prickles or spines, the first of which is by much the largest, the third is very small, and placed apart, farther back. The extremity of their pelvis is always salient and prickly, and behind it are some spines engaged in the skin, which in the long species have been considered as rays of the ventrals.

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[1] *Balistes* is a name given to these fishes by Artedi, from their Italian name *Pesce balestra*, which is itself derived from some fancied resemblance between the movement of their great dorsal spine, and that of a cross-bow.

Some have no particular armature to the tail, and among them are some which have not behind the gills any scales larger than the others. Such is a species which we possess in the Mediterranean.

Balistes capriscus, L., Salvian, 207, and Will. I. 19. *Pourc, pesce balestra,* &c. Of a brownish grey, spotted with blue, or greenish. Its flesh is but little esteemed[1].

Others, with this tail not armed, have some larger scales behind the gills[2].

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[1] N.B. I suspect the *B. maculatus*, Bl. 151. to be only the *Capriscus*. I am even tempted to refer to the same, the B. *buniva*, Lacép. V. xxi. 1. Add *Bal. stellaris*, Schn., Lacép. I. vi. *Bal. sufflamen*, Mitch. vi. 2. *Bal. jellaka*, Cuv., *Lamayellaka*, Russel, I. 22.

[2] *Bal. forcipatus* Will. I. 22. *Bal. vetula*, Bl., 150. *Bal. punctatus*, Gm., Will. App. 9. f. 4. We might also distinguish the *Bal. noir*, Lacép. I. xv. remarkable for its superior lateral teeth being prolonged like canines, and the large forks of its tail. N.B. The *B. niger*, Schn., does not differ from the *ringens; Bal. fuscus*, Schn., or *B. grandes tâches*, Lacép. I. 373, remarkable for its cheeks being naked, and furnished with ranges of tubercles.

The majority have the sides of the tail armed with a certain number of ranges of spines curved forwards, and all those of this division, with which we are acquainted, have some larger scales behind the gills[1].

Monacanthus, *Cuv.*,

Have but very small scales, bristling with stiff excrescences, and extremely crowded. The extremity of their pelvis is projecting and spiny, as in balistes proper, but they have only one large dentated spine to their first dorsal, or at least the second is almost imperceptible.

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[1] Species with two or three ranges of spines: *Bal. lineatus*, Schn. 87. Renard. 217, or *B. lamouroux*, Quoy and Gaym., Zool. de Freycin, pl. xlvii. f. 1. *Bal. cendré*, Lacép. I. xvii. 2; or *B. arcuatus*, Schn. Journ. de Phys. Juillet, 1744.

Species with three ranges: *Bal. aculeatus*, L., Bl. 149. Lacép. I. xvii. 1.; Renard, i. 28. f. 154. and ii. 28. f. 136. *Bal. verrucosus*, L., Mus. ad. fig. xxvii. 57. the same as the *B. pralin*, Lacép. i. 335. and the *B. viridis*, Schn.

Species with four or five ranges: *Bal. écharpe*, Lac. I. xvi. 1; or *Bal. rectangulus*, Schn., or *Bal. medinilla*, Quoy. and Gaym. Zool. de Freyc. pl. xlvi. f. 2. *Bal. conspicillum*, Schn., Renard, i. 15. f. 88. and Lacép. I. xvi. 3, under the false name of *Baliste Américain*; it is from the Indian Ocean. *B. viridescens*, Schn., or *verdâtre*, Lacép. I. xvi. 3.

Species with six or seven ranges: *Bal. armé*, Lacép. I. xviii. 2.—N.B This is neither the *Armatus* of Schn., nor, as he thought, his *Chrysopterus*;—*Bal. ringens*, Bl. 152. 2., or *niger*, Schn., or *Silloné*, Lacép. I. xviii. 1.

Species with twelve or fifteen ranges: *Bal. bursa*, Schn. B. *bourse*, Lacép. iii. 7; Renard, i. 7. and Sonnerat. Journ. de Phys. 1774.

Species whose spines are scarcely perceptible, being reduced to small tubercles. *Bal. bridé*, Lacép. I. xv. 3; *Bal. etoilé*, Lacép. I. xv. 1; or *B. stellaris*, Schn.; or *Dondrum yellakah*, Russell, xxiii.

N.B. If the Balistapus of Tilesius, Mém. de l'Ac. de Petersb. VII. ix. in reality wants the pelvis, it should form a subgenus at the end of the balistes properly so called.

In some the bone of the pelvis is very mobile and attached to the abdomen by a sort of extensible dewlap; there are often strong spines to the sides of their tail[1].

Others are distinguished because the sides of their tail are bristled with rough setæ[2].

Others because their body is altogether covered with small pedicled tubercles[3].

Others, again, because it is furnished with ciliæ, slender, and often branched[4].

Others, in fine, want these divers characters[5].

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[1] *Balistes chinensis*, Bl. 152. 1. *Bal. tomentosus*, Id. 148. which is not that of Linnæus, but the *Pira aca*, Marcg. 154. *Bal. Japonicus*, Tiles. Mém. de la Soc. de Moscow, tome ii. pl. xiii. *Bal. pelleon*, Quoy and Gaym. Zool. de Frecyc. pl. xlv. f. 3. *Bal. geographicus*, Per., Cuv., Règne Animal, pl. ix. f. 2.

[2] *Bal. tomentosus*, L., Seb. III. xxiv. f. 18. Gronov. Mus. vi. f. 5. *B. à brosses*, *Bal. scopas*, Commers. Lacép. I. xviii. 3. conforms to the description which Linnæus gives of the *Hispidus*, but not to the character figure of Seba which he cites.

[2] *Balistes papillosus*, Schn., White, p. 254.

[4] *Bal. penicilligerus*, Péron., Cuv., Règne Animal, pl. ix. f. 3. *Bal. villosus*, Ehrenb.

[5] *Bal. hispidus*, L., Seb. III. xxxiv. 2. *Bal. longirostris*, Schn. Seb. III. xxiv. 19. *Bal. Papillosus*, L ?, Lacép. I. xvii. 3. under the name of *monoceros*, Clus. Exot. lib. VI. cap. xxviii. *Bal. villosus*, C. *Bal. guttatus*, C.

ALUTERES, *Cuv.*,

Have the body elongated, covered with small and crowded grains, scarcely sensible to the view; a single spine to the first dorsal; and, what constitutes their peculiar character, the pelvis entirely concealed under the skin, and not forming the spiny projection observable in the other balistes[1].

TRIACANTHUS, *Cuv.*,

Are distinguished from all the other balistes, because they have sorts of ventrals, sustained each by a single large spinous ray, and adherent to a pelvis not salient. Their first dorsal, after one very large spine, has three or four small ones. Their skin is furnished with small crowded scales; their tail is more elongated than in the other subgenera.

But a single species is known, from the Indian Ocean[2].

OSTRACION, *L.*, (Vulg. *Trunk-fish.*)

Have, in lieu of scales, osseous and regular compartments soldered into a sort of inflexible cuirass, which invests the head and body, so that they have nothing moveable except the tail, the fins, the mouth, and a sort of small lip which furnishes the edge of their gills, all these parts passing through holes in this cuirass. The greater number of their vertebræ, also, are cemented together; their jaws are armed each with ten or a dozen conical teeth. At their gills nothing is seen externally but a cleft furnished with a cutaneous lobe; but internally, they present an operculum and six rays. The bone of the pelvis is wanting, as well as the ventrals, and there is but a single dorsal and an anal, both small.

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[1] *Bal. monoceros*, L., Catesb. 19; the *monoceros* of Bl., which is different, 147. *Bal. lævis*, Bl. 414. *Acaramucu*, Marcgr. 163, still different from the preceding three. *Bal. Kleinii*, Klein. Misc. III. pl. iii. f. 2. *Al. cryptacanthus*, C., Renard, II. part of pl. xlii. f. 284.

[2] *Bal. biaculeatus*, Bl. 148. 2. We shall have numerous species of all these subgenera to describe in our History of Fishes.

They have but little flesh, but their liver is large, and yields a considerable quantity of oil. Their stomach is membranous and pretty large. Some of them have been suspected of being poisonous.

They may be divided according to the form of their body, and the spines with which it is armed; but we are not yet certain that there may not be, in this respect, some differences between the sexes[1].

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[1] 1. *Ostraciones*, with triangular body, without spines: *Ost. triqueter*, Bl. 130. *Ost. concatenatus*, Bl. 131.

2. Triangular, armed with spines behind the abdomen: *Ost. bicaudalis*, Bl. 132. *Ost. trigonus*, Bl. 135.

3. Triangular, armed with spines in front, and behind the abdomen: *Ost. quadricornis*, Bl. 134.

4. Triangular, armed with spines on the crests: *Ost. stellifer*, Schn. 97; the same as *Ost. bicuspis*, Blumenb. Abb. 58.

[5. With

5. With quadrangular body without spines. *Ost. cubicus*, Bl. 137. *Ost. punctatus*, et *lentiginosus*, Schn., Sêb. III. xxiv. 5; Lacép. I. xxi. 1; or *Meleagris*, Sh. Gen. Zool. V. part II. pl. clxxii. *Ost. nasus*, Bl. 138. Will. I. ii. *Ost. tuberculatus*, Will. I. 10.

6. With triangular body, armed with spines in front and behind the abdomen: *Ost. cornutus*, Bl. 133.

7. With quadrangular body armed with spines in the crests: *Ost. diaphanus*, Schn., p. 501. *Ost. turritus*, Bl. 136.

8. With compressed body, carinated abdomen, and scattered spines: *Ost. auritus*, Sh., Nat. Misc. IX. No. 338; and Gen. Zool. V. part II. pl. clxxiii. The same as the *Coffre* (ostracion) *quatorze piquans*, Lacép., An. Mus. IV. lviii. 1, and some neighbouring species.

N.B. *Ost. arcus*, Séb. III. xxiv. 9, is perhaps only a variety of *cornutus*, and the *gibbosus*, Aldrov. 561, appears to me only a *triqueter*, badly drawn.

SUPPLEMENT

ON THE

ORDERS LOPHOBRANCHII AND PLECTOGNATHI.

THESE two orders we blend together in our supplementary remarks, as the first is so very short, and affords so few materials for observation.

The name SYNGNATHUS, which was bestowed by Artedi on its first genus, is derived from the Greek words *σὺν* and *γνάθος*, and indicates a union of the jaws.

The *Syngnathus typhle* is little more than a foot or eighteen inches in length, and the fins are grey, and very small. It inhabits the Atlantic and Mediterranean, where it has been anciently observed, since Aristotle and Pliny have mentioned it and spoken of its habits. It also frequents, in summer, though rarely, the region of the Algæ, on the coasts of the maritime Alps, and is very much multiplied along the shores of Egypt, between Aboukir and Alexandria. It appears that it is also to be met with in the north sea and in the Baltic.

It is not eaten in consequence of its having very little flesh, and is merely employed as a bait in fishing. It feeds only on worms, small mollusca, and the eggs of fishes.

The generation of the Syngnathi has this peculiarity, that the eggs slip into, and are disclosed in a pouch, which is formed by a swelling of the skin, in some under the belly, in others under the base of the tail, and which divides to allow the little ones to come forth alive, and already sufficiently developed to provide for their own necessities.

Of the next order PLECTOGNATHI, family GYMNODONTES, the genus DIODON is deserving of some observations in addition to the text.

The diodontes live on crustacea and fucus. Their flesh is generally mucous, and in no great estimation. They have the power, as stated in the text, of swelling themselves out by swallowing air, and filling their stomach with this fluid. When they are thus inflated, they turn upside down; their belly comes uppermost, and they float upon the surface of the water, without being able to direct themselves. This proves a means of defence to them, because the spines with which their skin is furnished are then erected on all sides.

From the faculty they possess of distending their bodies with air, these fishes have received in France the vulgar names of *boursouflus*, which means bloated or blown up, our *balloon-fish;* and *orbes,* from the globular form which they assume. That of *diodon* comes from the number of their teeth, which it expresses in Greek, (*δὶς*, *two*; and *ὀδοὺς*, *tooth.*)

The species of this genus live in the seas of warm climates; we are in possession but of few details concerning each of them; but we shall examine the most important, observing, however, at the same time, that very considerable confusion predominates in their determination.

The *diodon Atinga,* inhabits the seas of India, America, and South Africa. It is found in abundance between the tropics, and in the neighbourhood of the Cape of Good Hope. It feeds upon small fishes, crustacea, and testacea, whose calcareous envelope it easily breaks by means of its robust jaws. It seldom removes to any distance from the coasts.

The males are smaller than the females, which usually arrive to the length of fifteen or eighteen inches.

It is difficult, and even dangerous, to take this fish in the hand, for it knows very well how to defend itself by bristling up its spines. It is principally when it is attacked that it inflates its body, and then, all on a sudden, it forcibly expels the air which it has swallowed, and this air, rushing through the mouth and the apertures of the gills, produces a roaring sound, like that sent forth by the balista and some other fishes. Marcgrave is the first naturalist who has spoken of this circumstance.

This diodon is usually caught in nets, with other fishes. It is also taken with the hook, to which is attached the tail of some crustaceous animal, by way of bait.

Its flesh is hard, and not very savoury; it forms, however, an article of food. Pison assures us that its gall is poisonous, and that if it be not removed, it causes death to those who are so imprudent as to eat of the animal thus prepared. Their sensibility becomes blunted, the tongue immoveable, the limbs grow stiff, and life is extinguished, while a cold and colliquative sweat inundates the entire body. The wound inflicted by its prickles, or spines, is likewise considered dangerous. Serious accidents are also said to be experienced, if care be not taken to withdraw from the viscera of these animals, when they are prepared for the table, the remains of the aliments which they may be found to contain.

The swimming bladder of the atingas is very large. M. de Lacépède thinks, that by preparing it in a proper manner, a very excellent isinglass might be made from it.

The stomach of these diodons is thin, and furnished with many appendages, which, like so many small cœcal pouches, may augment the quantity of the gastric juices, or contribute to the necessary completion of digestion, by retarding the course of the alimentary matters. Their liver, thick and trilobate, extends almost to the anus.

The *diodon holocanthus* lives in all the seas between the tropics. Like the atinga it gives itself up to very violent and rapid movements when it finds itself taken, and particularly when it has bit at the hook. It inflates and compresses itself alternately, erects and inclines its darts, raises and lowers itself with rapidity, to disengage itself from the hook which retains it: it is exceedingly dangerous to take hold of it.

It appears that it is fished for in the Red Sea, and in that of Japan.

According to Father Dutertre, it is necessary in catching this fish, to bait the line with a crustaceous animal. It approaches the bait at first with caution, tastes it, retires, comes back, and finally swallows it; as soon as it finds itself hooked, it swells up like a balloon, sends forth a dull sound, like the turkey-cock, when he makes the wheel, and becomes exceedingly furious. But soon, finding its efforts useless, it has recourse to stratagem. It lowers its spines, disinflates itself, and becomes as flabby as a wet glove. It does not resume its activity until it perceives that the fisherman is drawing it towards him.

The *Diodon hystrix*, which Commerson observed in the living state, in the bay of Rio Janeiro, is also found near the Cape of Good Hope, and at the Molucca Islands. Its flesh is a species of food more or less dangerous, at least in certain circumstances. Its exuvia was formerly suspended to the ceilings of cabinets of natural history, and in the shops of apothecaries and druggists.

The TETRAODON also derives its name from the number of its teeth, which are four. The fish of this genus, like those of the preceding, are distinguished by the faculty of inflating their bodies like a balloon, and then floating upside down at random upon the surface of the water.

They have, moreover, a bilobate hydrostatic bladder, and kidneys which, being placed very high, have been erroneously taken for lungs by several writers.

The *Fahaca,* or *tetraodon lineatus*, more anciently known than the other species of the genus, inhabits the Nile, which spreads it in abundance over the land, at the period of the inundations, after which it serves as a play-thing to children, though, according to Hasselquist, the Egyptians hold it in abhorrence, and are persuaded that the use of its flesh will produce death. The short spines, or prickles, with which it is armed, produce all the disagreeable effects occasioned by the stinging of nettles.

The *Tetraodon hispidus* of Lacépède, which must not be confounded with that of Linnæus, frequents the seas of the Indies, and the Mediterranean, particularly towards the shores of Northern Africa, and even at the mouth of the Nile, and the other great rivers of these countries. Its flesh is by no means good for eating, but it does not appear to be poisonous.

In many of the countries subjected to the yoke of the Mussulmans, after having inflated the tetraodon hispidus with air, they submit it to a careful desiccation, and suspend it to the pinnacle of the minarets, and on the highest points of buildings, in place of weather-cocks.

It appears from some observations that at Monte Bolca, near Verona, a fish analogous to this has been found in a state of petrifaction.

The *Tetraodon Commersonii* inhabits the various breaks along the coasts of the Praslin Islands, where it has been observed by the indefatigable Commerson. When it is inflated it appears of the size of the head of an infant newly born. The more it is touched and tormented the greater bulk it acquires, as if it sought by this means to defend itself against the hand which annoys it.

The *Tetraodon ocellatus* lives in Egypt, like the fahaca, of which we have already spoken, and where it is regarded as an insalubrious and even dangerous food, when it has not been cleansed with the greatest care.

It appears to be an error to unite this fish to the *furube* of the Japanese, which has been figured by Seba, and of which Kœmpfer and Rumph have given some details. This furube forms a peculiar species, and is equally abundant and feared in Japan, where it is nevertheless sought after with eagerness, because it is considered to be very delicate eating, when the head, the bones, and the viscera have been removed, and the flesh washed and cleansed with the utmost care. The epicures of the country, we are told, frequently fall a sacrifice to the unwholesome and indigestible character of this food. According to Osbeck it will cause death in two hours to those who have fed upon it, without using the precautions just mentioned. It even appears that this fish is employed to terminate an existence which has become a burthen to them, by those unfortunates, whom chronic maladies, or a long series of misfortunes, have thrown into a state of despair. The imperial decrees even expressly forbid the soldiers to buy or to eat of the furube, and that with so much severity, that if any one of them should die in consequence of his disobedience, his son loses the right of replacing him. It is, moreover, sold at a much dearer rate than the common fish, and never eaten but when it is perfectly fresh.

According to Rumph the remedy for the accidents caused by the furube, is the administration of a plant which he has named *rex amaroris*, and which appears to be the *ophioxylon serpentinum* of Linnæus. The *anisum stellatum* (anise) on the contrary, much increases the subtilty and violence of the poison, according to the assurance of Kœmpfer in his *Amœnitates*.

The *Tetraodon electricus* inhabits the midst of the banks of coral excavated by the sea, which surround the Isle of St. John, near that of Amorre, in the Indian Ocean. It was first observed there in 1786, by Lieutenant Wm. Patterson. It is about seven inches long, and possesses, as is indicated by its name, the faculty of communicating smart shocks to those who attempt to seize hold of it.

In the second family of plectognathi, our notice must be limited to the BALISTES.

The ancients gave the name of *balista* to an engine of warfare, which sent forth darts to a great distance, by means of a spring very tightly drawn, and which, when the arrow was discharged, rapidly become straight again. The name has been bestowed by naturalists on this genus of fishes, the species of which have a long spine, inclined upon the back, but which can be thus suddenly elevated at the will of the animal.

If the balistes have neither the habit nor the means of attacking other fishes, they can live and travel with the utmost security in the bosom of the waters, for nature has bestowed upon them, as offensive weapons, very sharp spines, disposed on various parts of the body and the head, accordingly, the voracious fishes dare not attempt to swallow them. Their powerful teeth, of which the anterior two may be compared to incisors, enable the balistes to break the envelope of the crustacea and testacea, on which, on mollusca generally, and on marine worms, they principally feed.

It has been asserted that the balistes were ill-flavoured fish, and that their flesh is sometimes poisonous, or at least extremely deleterious. It is probable, however, that if they really possess any hurtful quality, it is to be found in the spines which nature has bestowed upon them for their defence; for these spines are invested with a viscous liquor, which may be poisonous, and calculated to produce inflammation in the wounds which they cause.

Besides their air-bladder, the balistes have also the faculty of increasing their volume, and of rendering themselves much lighter in the water, by filling their bodies with a great quantity of air. This must supply the weakness of their fins, and contribute to their swifter motion through the water. When these singular fishes are desirous of descending into the depths of the sea, they expel the air through the aperture of their mouth and gills, by compressing themselves almost suddenly; and it is thus that they send towards the surface of the water a hissing sound more or less prolonged. Black, ashen, blue, yellow, and red, are the colours which serve to adorn these fishes, which live in the warmest seas of India and America. Two species only inhabit the Mediterranean.

THE

SECOND SERIES OF THE CLASS OF FISHES,

OR THE

CHONDROPTERYGII,

Cannot be considered as either superior or inferior to ordinary fishes; for many of its genera approximate to the reptiles in the conformation of the ear, and of the genital organs, while others exhibit such a simplicity of organization, and their skeleton is reduced to such a trifle, that we might hesitate to number them among vertebrated animals. This division may then be considered as a series, in some measure parallel to the first, just as the marsupiate animals may be considered as parallel to the other unguiculated mammifera.

The skeleton of the Chondropterygii, is essentially cartilaginous; that is, no osseous fibres are formed in it, but the calcareous matter is deposited in little grains, and not in threads or filaments. From this it results that there are no sutures in their cranium, which is always formed of a single piece, but in which we can distinguish, by means of the projections, hollows, and foramina, certain regions analogous to those of the cranium of other fishes. It will even happen that some mobile articulations, existent in the other orders, do not manifest themselves at all in this: for example, part of the vertebræ of certain rays are united into a single body; some of the articulations of the bones of the face also disappear, and even the most apparent character of this division of the class of fishes is to want the maxillary and intermaxillary bones, or rather to have them only in vestiges concealed under the skin, while their functions are performed by bones analogous to the palatines, and sometimes even by the vomer. The gelatinous substance which, in the other fishes, fills the intervals of the vertebræ, and communicates from one to the other only by a small hole, forms, in several chondropterygii, a cord which runs through all the bodies of the vertebræ, almost without varying in diameter.

This series is divided into two orders: the chondropterygii, whose gills are free, like those of ordinary fishes, and those whose gills are fixed, that is, attached to the skin by their external edge, so that the water does not issue from their intervals, except through the holes of the surface.

THE

FIRST ORDER OF CHONDROPTERYGII,

OR THE

SEVENTH ORDER OF FISHES.

THE STURIONES, OR CHONDROPTERYGII WITH FREE GILLS.

Are yet pretty clearly connected with ordinary fish, by their gills, which have but a single orifice, very open, and furnished with an operculum, but without rays to the membrane.

It comprehends but two genera,

Acipenser[1], *L.* (The *Sturgeons.*)

Fishes whose general form is the same as that of the squali, but whose body is more or less furnished with osseous bucklers implanted on the skin in longitudinal ranges. Their head is cuirassed in the same manner externally; their mouth, placed under the muzzle, is small and devoid of teeth; the palatine bone is cemented to the maxillaries, and we find the intermaxillaries in a rudimentary state, in the thickness of the lips; supported on a pedicle with three articulations, this mouth is more protractile than that of the squali; their eyes and nostrils are at the sides of the head; some barbels depend from the muzzle. The labyrinth is entire in the bone of the cranium, but there is no vestige of an external ear; a hole pierced behind the temple is only the vent which conducts to the gills. The dorsal is behind the ventrals, and the anal is under it. The caudal surrounds the extremity of the spine, and has a salient tube underneath, shorter, however, than its principal point. Internally, we find the spiral valve of the intestine and the pancreas united into a mass, as in the selacii; but there is, moreover, a very large natatory bladder, communicating by a wide hole, with the œsophagus.

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[1] Acipenser is their ancient Latin name; *Sturio*, from which the word *sturgeon* is derived, is modern, probably their German name, *Stoer* Latinized.

The sturgeons ascend in abundance from the sea into certain rivers, where they constitute very profitable fisheries. Most of their species have well-flavoured flesh. Caviar is made of their eggs, and isinglass of their natatory bladder,

We have in western Europe,

Acipenser sturio, L., Bl. 88. (the common sturgeon). Six or seven feet long, with pointed muzzle; its bucklers, disposed in five ranges, are strong and spiny. It flesh is rather similar to that of veal.

The rivers which discharge themselves into the Black sea, and into the Caspian, produce, with our common sturgeon, three other species of this genus, and perhaps more[1].

Acipenser Ruthenus, L., *A. pygmæus,* Pall., Bl. 89. (the sterlet). Which does not exceed two feet in length, and in which the bucklers of the lateral ranges are more numerous, carinated, and those of the belly flat. It is considered delicious, and its caviar is reserved for the court.

There is reason to believe that it is the *Elops* and the *Acipenser,* so celebrated among the ancients[2].

Acipensor helops, Pall., *Ac. steuatus,* Bl., Schn., Marsil. Dan. IV. xii. 2. Attains to four feet in length, and has the beak longer and more slender, and the bucklers more bristled than the others. Its abundance is prodigious; but it is not so good as the sturgeon.

Acipenser huso, L., Bl. 129. (the great sturgeon). Whose bucklers are more blunt, the muzzle and barbels shorter than in the ordinary sturgeon; the skin is smoother. It often attains twelve and fifteen feet in length, and more than twelve hundred pounds weight; one has been seen which weighed nearly three thousand. The flesh of this species is not so good, and is sometimes even unwholesome. With the natatory bladder of this fish the best isinglass is made. It also ascends into the river Po.

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[1] The species of the sturgeon are as yet but ill determined by naturalists, and even Pallas, who was best acquainted with them, has not assigned them, in his Russian Zoology, comparative characters sufficiently distinct, and he neither agrees with Kramer, nor with Guldenstedt, nor with Lechepin. On the other hand, the figures of Marsigli are too rude. We should expect better of the Austrian naturalists, to whom the Danube presents these fishes in abundance.

[2] See my note on Lemaire's edition of Pliny, vol. ii. 74.

North America possesses several species of sturgeon peculiar to itself[1].

POLYODON, *Lac.*, SPATULARIA, *Sh.*,

Are directly recognized by an enormous prolongation of their muzzle, to which its widened edges give the figure of the leaf of a tree. Their general form, and the position of their gills, resemble those of the sturgeons; but their gills are still more open, and their operculum is prolonged into a membranaceous point, which is extended as far as the middle of the body. Their mouth is very much cleft, and furnished with many small teeth. The upper jaw is formed of the union of the palatines to the maxillaries, and the pedicle has two articulations. The spine of the back has a cord like that of the lamprey. We find in the intestine the spiral valvule, common to almost all the chondropterygii, but the pancreas commences to be divided into cœca. There is a natatory bladder.

But a single species is known, from the Mississippi, *Polyodon feuille*, Lac. I. xii. 3; *Squalus spatula*, Mauduit. Journ. de Phys. Nov. 1774. pl. ii.

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[1] *Acip. oxyrhyncus*, Lesueur, Amer. Trans., new series, vol. i. p. 394. *Ac. brevirostris*, Id. ib. 390. *Ac. rubicundus*, Id. ib. 388; and pl. xii. which appears very much to resemble the sterlet. *Ac. maculosus*, Id. ib. 392, very much approaches the common sturgeon.

CHIMÆRA[1], *L.*,

Exhibit the closest relation with the squali by their general form, and the position of their fins; but all their gills open externally by a single hole apparent on each side, though on penetrating more deeply, we see that they are attached by a great part of their edges, and that there are in reality five particular holes leading to the bottom of the general hole. They have, nevertheless, a vestige of operculum concealed under the skin. Their jaws are still more reduced than in the squali, for the palatine and tympanic bones are also simple vestiges suspended to the sides of the muzzle, and the upper jaw is represented only by the vomer. Some hard and indivisible plates furnish the jaws instead of teeth, four to the upper, two to the lower. The muzzle, supported like that of the squali, projects in front, and is pierced by pores disposed on rather regular lines; the first dorsal, armed with a strong prickle, is placed above the pectorals; the males are recognized, like those of the squali, by osseous appendages to the ventrals, but which are divided into three branches, and they have, moreover, two spinous laminæ, situated in front of the base of the same ventrals. Finally, they have between the eyes a fleshy shred terminated by a group of small prickles. The intestine of the chimæræ is short and straight, nevertheless we see in the interior a spiral valvule, as in the squali. They produce very large coriaceous eggs, with the edges flatted and hairy. In

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[1] This name has been given to them in consequence of their fantastic figure, which even appears monstrous when they have been dried with insufficient care, as were the first individuals represented by *Clusius*, *Aldrovandus*, &c.

CHIMÆRA, *Cuv.*, (properly so called),

The muzzle is simply conical; the second dorsal commences immediately behind the first, and extends as far as the end of the tail, which is prolonged into a long filament, and is furnished underneath with another fin similar to the caudal of the squali.

But one species is known,

Chimæra monstrosa, L., (the *Arctic chimæra*) Bl. 124, and Lacép. I. xix. 1, the female; vulg. *king of the herrings;* in the Mediterranean *chat.* Two or three feet in length, of a silvery colour, spotted with brown. It inhabits our seas, where it is fished for, especially in the train of migrating fish. In

CALLORHYNCHUS, *Gronov.*,

The muzzle is terminated by a fleshy shred, comparable in form to a hoe. The second dorsal commences over the ventrals, and finishes opposite the commencement of that which furnishes the under part of the tail.

There is also but one species of this subgenus known,

Chimæra callorhynchus, L., (the Antarctic Chimæra) Lacép. I. xii., the female; it belongs to the southern seas.

THE

SECOND ORDER OF CHONDROPTERYGII, AND EIGHTH OF FISHES,

OR

CHONDROPTERYGII WITH FIXED BRANCHIÆ.

Instead of having the gills free at the external edge, and opening at their intervals into a wide common foss, as in all the fishes of which we have spoken hitherto, these have them, on the contrary, adherent by this external edge, so that they suffer the water to escape by as many holes pierced in the skin as there are intervals between them, or at least those holes terminate in a common conduit, which transmits the water to the outside. Another circumstance peculiar to these fishes, consists in having small cartilaginous arches, often suspended in the flesh, opposite the exterior edge of the gills, and which may be called branchial ribs.

The Chondropterygii with fixed gills of the first family, or the

Selacii, (Plagiostomi, *Desm.*)

Hitherto comprehended under two genera, Squalus and Raia, have many characters in common.

Their palatine and post-mandibular bones, alone armed with teeth, serve instead of jaws, and the ordinary bones of the jaws only exist in a rudimentary state; a single bone suspends these apparent jaws to the cranium, and represents at once the tympanic, jugal, and temporal bones, and the preoperculum. The *os hyoïdes* is attached to this singular pedicle of which we have just spoken, and bears branchiostegous rays as in ordinary fishes, although they do not appear so much externally. It is even followed by branchial arches, but there are none of the three pieces which compose the operculum. These fishes have pectorals and ventrals; the latter are situated behind the abdomen, and on the two sides of the anus. Their membranous labyrinth is enclosed in the cartilaginous substance of the cranium; the sac, which forms a part of it, contains only amylaceous masses, and not stones. The pancreas is in the form of a conglomerate gland, and not divided into tubes or distinct cœca. The intestinal canal is short in proportion, but a part of the intestine is furnished internally with a spiral lamina, which prolongs the stay of the aliments.

In sexual intercourse there is a real intromission; the females have oviducts very well organized, which serve in lieu of matrix to those whose young are disclosed in the body; the others form eggs, invested with a hard and corneous shell, to the production of which, a thick gland which surrounds each oviduct contributes. The males are recognized by certain appendages, placed at the internal edge of the ventrals, often very large and very complicated, and the general use of which is not yet very well known.

SQUALUS[1], *L.*,

Form a first great genus, which is distinguished by an elongated body, a thick and fleshy tail, and pectorals of middle size, so that their general form approaches that of ordinary fishes; thus, the apertures of their gills are found to correspond to the sides of the neck, and not to the under part of the body, as we shall find to be the case in the rays. Their eyes are equally at the sides of the head. Their muzzle is supported by three cartilaginous branches, which are attached to the anterior part of the cranium, and we easily recognize in the skeleton the rudiments of their maxillaries, of their intermaxillaries, and their premandibulary bones.

Their shoulder-bones are suspended in the flesh behind the gills, without being articulated either to the cranium or the spine. Several are viviparous. The others produce eggs invested with a yellow and transparent horn, the angles of which are prolonged into corneous cords. Their little branchial ribs are apparent, and they have also small ones along the sides of the spine; this last is entirely divided into vertebræ. Their flesh, in general coriaceous, forms an article of food for the poorer sort alone.

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[1] *Squalus*, the Latin name of a fish, employed by some ancient authors, but the species to which it applied remains undetermined. Artedi has bestowed it upon this genus. We also find *squalus* for *squatina*.

This genus is numerous, and may form a considerable number of subgenera.

We separate at first,

SCYLLIUM, *Cuv.*,

Which are distinguished from the other squali by their short and obtuse muzzle, by their nostrils being pierced near the mouth, continued on a furrow which extends to the edge of the lip, and more or less closed by one or two cutaneous lobules. Their teeth have a point on the middle, and two smaller ones on the sides. They all have air-holes, and an anal. Their dorsals are very far back, the first being never more forward than the ventrals; their caudal is elongated, not forked, and truncated at the end; the apertures of their gills are partly above the pectorals.

In some, the anal corresponds to the interval of the two dorsals: such are the two species of our coasts, often confounded or ill distinguished.

Sq. canicula, L., Bl., 114. Rondel. 380. Lacép. I. x. 1. (the great roussette). With numerous small spots, and ventrals cut obliquely.

Sq. catulus, et *Sq. stellaris,* L., Rond. 383. Lac. I. ix. 2. (the little roussette). Spots more infrequent and broad, sometimes in the form of eyes; ventrals cut squarely.

We possess a third species, with black and white spots[1].

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[1] Add the *Roussette* of Artedi, Risso, 2d. edit. f. 5; or *Squalus*

In other scyllia, all foreign, the anal is placed behind the second dorsal. The air-holes are remarkably small. The fifth branchial aperture is often concealed in the fourth; and the lobules of the nostrils are generally prolonged into barbels [1].

Under the name of

SQUALI, properly so called,

We comprehend all the species with prominent muzzle, under which are the nostrils not prolonged into a furrow, nor furnished with lobules; their caudal fin has a lobule underneath, which causes it more or less to approach the forked form. The ancient distribution, according to the absence or presence of air-holes and anal, may be preserved; but to render it natural, the divisions must be multiplied.

Species without air-holes, provided with an anal.

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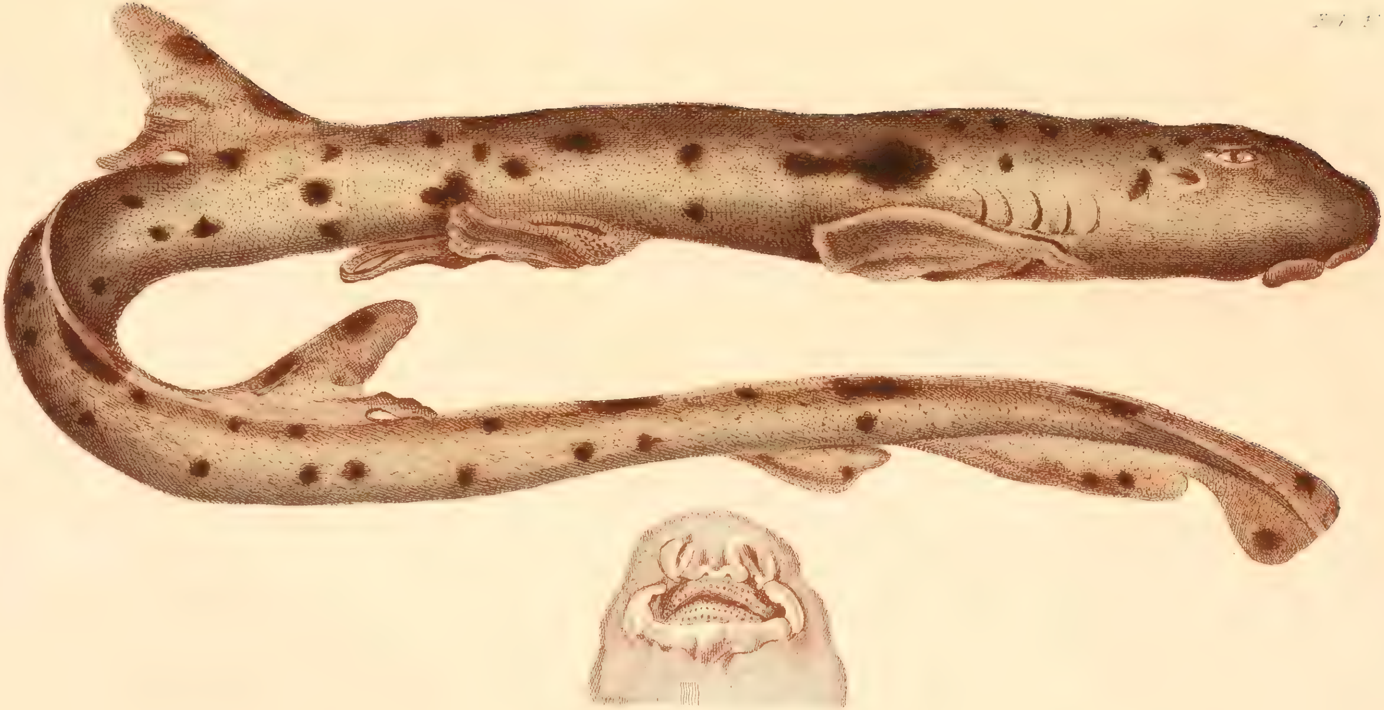
prionurus, Otto; the *Roussette* of *Gunner*, *Sq. Catulus*, Gunn, Mém. de Dronth. II. pl. i., which appears a separate species; the *Sq.* of *Edwards*, Edw. 289, under the false name of *Greater cat-fish*, which would indicate the Roussette, and which is cited erroneously, under the pretended *Sq. stellaris;* the *Sq. Africanus*, or *galonné* of Broussonet, Shaw, Nat. Misc. 346.—N.B. The word *longitudinalibus*, added gratuitously to the character by Gmelin, is not just; the pretended *Sq. canicula*, Bl. 112, which is a distinct foreign species, unless it be a very strongly marked variety of *catulus*.

[1] *Sq. pointillé*, Lac. II. iv. 3, the same as the *Sq. barbillon*, Brous. (*Sq. barbatus*, Gm.) and as the *Sq. punctatus*, Schn., Parra. pl. xxxiv. f. 2. *Sq. tigre*, Lac., or *Sq. fasciatus*, Bl. 113. (*Sq. tigrinus*, and *Sq. longicaudus*, Gm.) The *Sq. lobatus*, Schn., Phil. Voy. pl. xliii. p. 285. The *Bokee sorra*, Russ. Corom. XVI.



Squalus ocellatus

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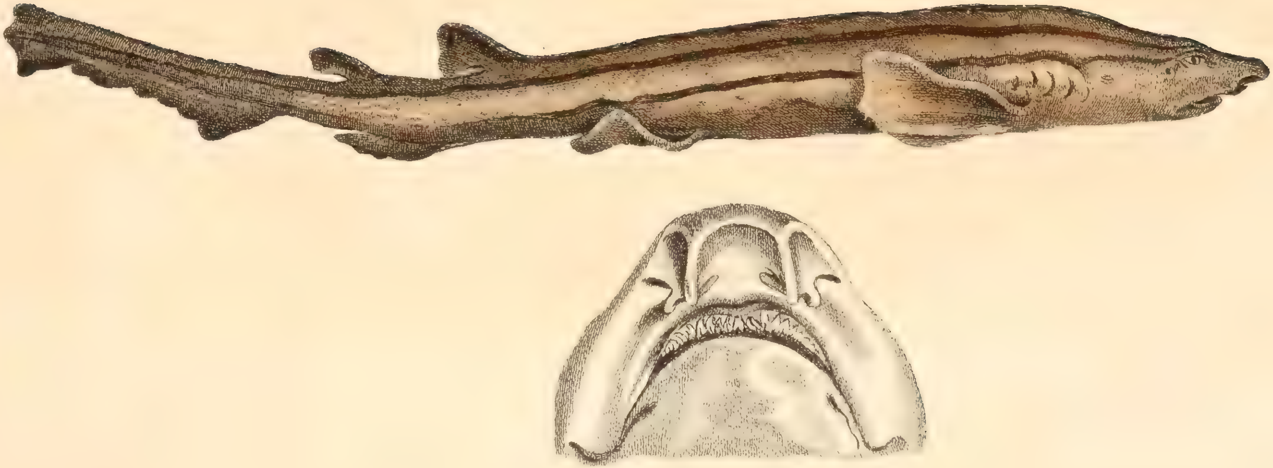

Scyllium Africanum.

Carcharias, *Cuv.*,

A numerous and most celebrated tribe; have the teeth trenchant and pointed, and most frequently dentated on their edges; the first dorsal very much before the ventrals, and the second nearly opposite the anal. They want air-holes; their depressed muzzle has the nostrils under its middle, and the last holes of the gills extend over the pectorals [1].

Sq. carcharias, L., Belon, 60 [2]. (white, or common shark, Fr. *Requin*). Reaches five-and-twenty feet in length, and is recognized by its teeth, nearly in the form of an isosceles triangle, with rectilinear sides, and dentated in the upper jaw; the lower have a narrow point, upon a broader basis, a terrible weapon, which causes terror to navigators. It appears to be found in all seas; but the name has been often given to other species with trenchant teeth.

We also catch upon our coasts

Sq. vulpes, L., Rondel. 387. (fox shark, or thrasher).

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[1] *Carcharias* is the Greek name of some large squalus, synonymous with *Lamia*.

[2] N.B. This figure of Belon is the only good one: the majority of the others are faulty. Bl. 119, is a very different species, which appears to approximate more to *Scymnus*. *Gunner*, Mém. de Dronth. II. pl. x. xi., the same described by Fabr., Groenl. 127, is another species, also approximating to scymnus. Rondel. 390, copied, Aldrov. 383, is the *Sq. cornubicus,* as well as Aldrov. 388, from which the anal only is removed; to the same fish belong the jaws, Id. 382. I shall not speak of the monstrous figure of Gesner, 173, copied, Will., B. 7; Lacép. I. viii. 1. is the *Sq. ustus.*

With teeth formed like an isosceles triangle, pointed in both jaws; particularly to be recognized by the superior lobe of its tail, as long as the whole body. Its second dorsal and anal are, on the contrary, extremely small[1].

Sq. glaucus, L., Bl. 86. (the blue shark). With slender body, of a slate-coloured blue above, pectorals very long, and very pointed; the upper teeth in a curvilinear triangle, bent towards the outside; the lower straighter; all dentated[2].

LAMNA[3], *Cuv.* (*Lamies,* or *Touilles,* Fr.)

Do not differ from the sharks but in their pyramidal muzzle, under the base of which are the nostrils, and because the holes of their gills are all in front of the pectorals.

That which is known in our seas.

Sq. cornubicus[4], Schn., Lac. I. ii. 3. (*Le nez,* French).

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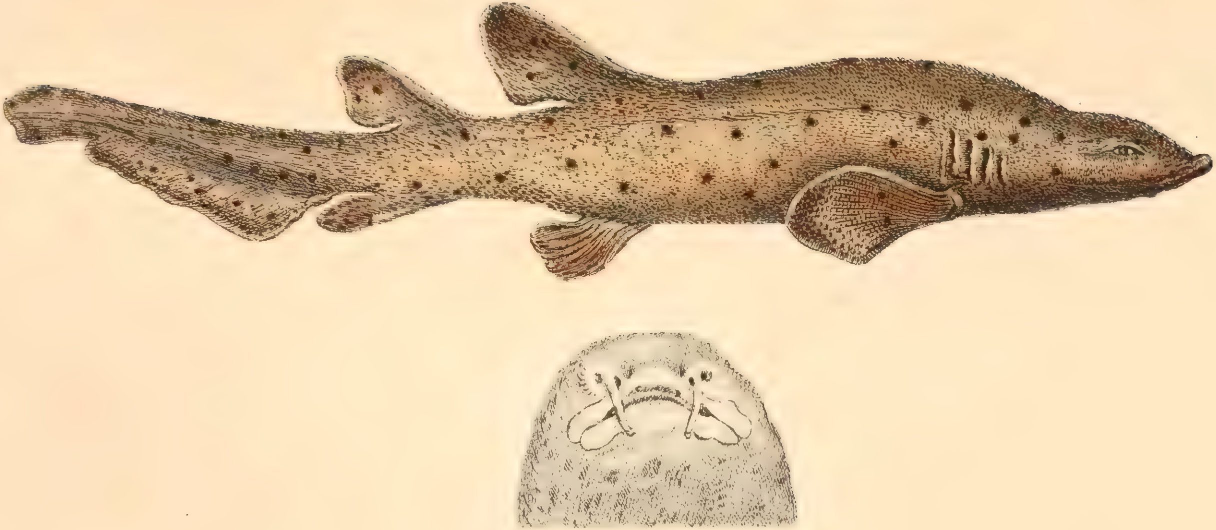
[1] It is on this last character that Rafinesque has founded his genus ALOPIAS.

[2] Add the *Sq. ustus,* Dum. (*Sq. carcharia minor,* Forsk.) Lac. I. viii. 1. *Requin à nageoires noires,* Quoy. and Gaym. Zool. de Freyc. pl. xliii. f. 1. The *Sq. glauque,* Lac. I. ix. 1, which is different from that of Bl. The *Sq. ciliaris,* Schn. pl., xxxi. in which the ciliæ only betoken extreme youth. The *Palasorrah,* and the *Sorrakowah,* Russ. XIV. and XV. and a considerable number of new species which we shall describe in our history of fishes.

[3] Lamna is one of the Greek names of *Lamie*: I could not employ the term *Lamia,* which has been applied by Fabricius to a genus of insects.

[4] The *Lamia* Rondelet, 399. the *Carcharias,* Aldrov. 383 and



Scyllium cirrhosum Young.

Has a salient keel on each side of the tail, and the lobes of its caudal almost equal. Its size has often caused it to be confounded with the shark[1].

Species uniting air-holes and an anal.

GALEUS[2], *Cuv.*,

Have pretty nearly in all respects the form of the sharks, but differ from them by having air-holes. But one is known in our seas; of middling size, and to be recognized by its teeth, dentated only at their external side. It is the *Sq. galeus*[3], L., Bl. 118. Duham. Sect. IX. pl. xx. f. 1 and 2.

MUSTELUS[4], *Cuv.*,

Present all the forms of carcharias and galeus; but

388, are nothing else but the *Sq. nez*, which has become very large, whatever Bloch may say, Ed. de Schn. p. 132. The pretended jaws of Carcharias, given by Aldrov. 382, are also those of the *nez:* it appears more common than the true shark in the Mediterranean.

[1] Add the *Beaumaris*, (*Sq. monensis*, Sh.,) which has the muzzle shorter, and the teeth more sharp. *Isurus oxyrhynchus*, Rafin. Caratt. XIII. 1, may well be a species of this genus, perhaps even the common species disfigured by stuffing.

[2] Galeus, the Greek generic name for the squali.

[3] It is also the *Lamiola*, Rondel. 377, copied, Aldrov. 394 and 393; Salv. 130. I. cop. Will. B. 6—1. If an enormous size has been sometimes attributed to it, it is because they have referred to it the jaws and teeth represented, Lacép. I. vii. 2, and Herissant, Ac. des Sc. 174, but which come from a foreign species, which we shall describe in our great work on ichthyology.

[4] *Mustelus* is the Latin translation of γαλεὸς, and generic for the squali. N.B. M. Rafinesque unites *Scyllium*, *Galeus*, and *Mustelus*, in his genus Galeus.

besides having air-holes, like the latter, they are distinguished by small and rounded teeth.

Our seas produce two, confounded under the name of *Sq. mustelus*[1], L.

NOTIDANUS[2], *Cuv.*,

Differ from galeus only in the absence of the first dorsal.

Squalus griseus, L., ; *Sq. vacca*, Schn., Augustin Scilla, pl. xvii.[3] Ash-coloured above, whitish underneath; is very remarkable for its six wide branchial apertures, and its teeth, triangular above, serrated below. Its muzzle is depressed and rounded, like that of the shark.

Squalus cinereus, Gm., has as many as seven branchial apertures very wide. Its teeth are tolerably like the lower ones of the preceding. Its muzzle is pointed like that of *cornubicus*[4].

These two species live in the Mediterranean[5].

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[1] The *Emissole commune*, Rondel. 375; Salv. 136. f. 2. cop. Will. pl. B. 5. fig. 1, and erroneously cited under galeus. The *Emissole tachetée de blanc*, Rond, 376. Bel. 71. cop. Ald. 393.

[2] Νωτιδανὸς, (dry back) the Greek name of some squalus in Athenæus.

[3] The teeth are well represented in this figure, but the fish very badly. It is the genus HEXANCHUS, Rafinesque.

[4] It is the genus HEPTRANCHIAS of M. Rafinesque, who erroneously denies it air-holes.

[5] Messrs. Quoy and Gaymard have discovered in the Indian Ocean, a species of this subgenus, entirely spotted with black, and with seven air-holes.

SELACHE[1], *Cuv.*,

Join to the form of the sharks, and the air-holes of galeus, branchial apertures large enough to surround almost the whole arch, and small conical teeth without dentations. The known species, *Sq. maximus*, L., (the basking shark) Blainville, Ann. du Mus, tom. xviii. pl. vi. f. 1., has nothing of the ferocity of the shark, although it exceeds it in size, as it does all the other squali. Individuals are found of more than thirty feet in length. It inhabits the northern seas, but is sometimes seen on our coasts, being brought hither by strong winds from the north-west[2].

CESTRACION, *Cuv.*,

Have, with the air-holes, the anal, and the rounded teeth of mustelus, a spine in front of each dorsal, like *spinax*, and, moreover, their pointed jaws advance as far as the muzzle, and have at the middle some small pointed teeth, and towards the angles some others very broad and rhomboidal, the assemblage of which represents certain spiral shells.

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[1] Selache, Σελάχη, a Greek name common to all cartilaginous fishes.

[2] See its anatomy by M. de Blainville, loc. cit.—N.B. The differences remarked between the figures and descriptions of Gunner, Dronth. III. ii. 1, of Pennant, Brit. Zool. No. 41, of Home, Phil. Trans. 1809, and of Shaw, Gen. Zool., may proceed from the difficulty of observing such large fishes, but cannot suffice for the establishment of distinct species. I do not perceive, moreover, in what the *Sq. elephas*, Lesueur, Ac. Sc. Nat. Phil. differs from this *Squalus maximus*.

But one species is known, which belongs to New Holland, *S. Philippi,* Schn., Phil. Voy. pl. cclxxxiii. and the teeth, Davila, Cat. I. xxii.

Species without an anal, but provided with air-holes.

Spinax, *Cuv.*,

Join, like Galeus and Mustelus, to all the characters of the sharks, that of the presence of air-holes, and are distinguished besides by the absence of an anal, by small trenchant teeth on several ranges, and by a strong spine in front of each of their dorsals.

One of the most common squali in our markets is the *Sq. Acanthias,* L. Bl. 85. Brown above, whitish underneath. The young ones are spotted with white, Edw. 288[1].

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[1] Add the *Sagre,* Brouss. (*Sq. spinax*), Gunner, Mem. de Dronth. II. pl. vii. The *Aiguillat Blainville,* Riss. 2d edit. f. 6.—N.B. The Squalus *uyatus,* Rafin. Caratt. pl. xiv. f. 2., does not differ from Spinax, and is probably the *Sq. spinax.* I think that his *Dalatias nocturnus,* Ib. f. 3., is only a Spinax, the air-holes of which have escaped him. His *Etmopterus aculeatus* also appears to me to be a Spinax, drawn after a dried specimen. The author only gives it three branchial orifices, but he reckons no more than three to the angel-fish, which most certainly has five.

CENTRINA[1], *Cuv.*,

Join to the spines, to the air-holes, and to the absence of anal in spinax, the position of their second dorsal over the ventrals, and a short tail, which gives them a more squat form than the other species. Their lower teeth are trenchant, and on one or two ranges; the upper narrow, pointed, and on several ranges. Their skin is very rough.

The most common species on our coasts is the *Sq. centrina*, L. Bl. 115.

SCYMNUS[2], *Cuv.*,

Have all the characters of centrina, except the spines to the dorsals. We have some of them also upon our coasts.

The *Leiche*, or *Liche*, Brouss., named *Squalus Americanus* by mistake[3].

There is one of them in the North Seas, which is said to be as terrible as the shark[4].

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[1] Κεντρίνη, the name of this fish, or of the spinax, in Greek, from κέντρον, a prickle. They are the *Oxynotus* of Rafinesque.

[2] *Scymnus*, the Greek name of the roussette, or some kindred species.

[3] Because Gmelin has confounded the Cape Breton, near Bayonne, with the Cape Breton, near Newfoundland. The *Sq. nicéen*, Risso, 1st edit. f. 6. is the same fish badly figured. It is a little better in the 2d edition, f. 4. The *Delatias sparophagus*, Raf. Car. xiii. 2. should also belong to this sub-genus.

[4] It is the pretended *Sq. carcharias* of Gunner, Dronth. II. x. and xi. and of Faber. Groen. 127. and perhaps that of Bl. 119. although

The Indian Ocean possesses one remarkable for the smallness of its first dorsal[1].

Another, the *Sq. écailleux,* Brouss., (*Sq. squamosus,* Lacép. I. x. 3. under the false name of *Sq. liche*) is remarkable for the small scales, in the form of leaves, raised and crowded, which furnish its entire skin. Its muzzle is long and depressed.

We distinguish from scymnus, some species which have the first dorsal over the ventrals, and the second farther back.

There is one completely furnished with small spines, the *Squale* bouclé, Lacép. I. iii. 2; *Sq. spinosus,* Bl. Schn.

We may form a second genus of

ZYGÆNA, *Cuv.* SPHYRNA, *Rafin.*

Which join to the characters of the sharks, a form of head, of which the animal kingdom presents no other example. Flatted horizontally, truncated in front, its sides are prolonged transversely into branches, which cause it to resemble the head of a hammer. The eyes are at the extremity of the branches, and the nostrils at their anterior edge.

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he gives it an anal. It is probably here that we must place the *Sq. brevipinnis,* Lesueur, Ac. Nat. Sc. Phil. I. 122. of which this author makes his genus SOMNIOSUS; but he does not describe the teeth.

[1] *Leiche laborde,* Quoy and Gaymard, Voy. de Frey. Zool. pl. xliv. f. 2.

The most common species in our seas, *Sq. Zygæna*, L.; *Z. malleus*, (the hammer-headed shark) Valenciennes, Mem. Mus. IX. xi. 1; Parra, 32; Salv. 40; Will. B. 1. is sometimes a dozen feet in length[1].

SQUATINA[2], *Dumer.*,

Has air-holes, and wants the anal, like the third subdivision of the squali, but it differs from all the squali in its mouth being cleft at the end of the muzzle, and not underneath, and its eyes being at the dorsal face, and not in the sides. The head is round, the body broad, and flatted horizontally; the pectorals are large and carried forward, but remaining separate from the back by a cleft, in which the apertures of the gills are pierced; the two dorsals are behind the ventrals, and the caudal equally attached above and below the spinal column.

We have one in our seas, which grows to a pretty large size. *Squatina angelus; Squalus squatina*, L.

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[1] Add the species represented by Bl. 117. to be recognised by its nostrils being placed much nearer the middle (*Z.* Nob. *Blochii*), Val. Mem. Mus. IX. xi. 2. Its second dorsal is also much nearer the caudals. The species with a broad head, given under the name of *pantouflier*, Lac. I. vii. 3. It is the *pantouflier* of Risso, *Zyg. tudes*, Val. Mem. Mus. IX. xii. 1. *Koma sorra*, Russel, xii. 2. The true *pantouflier* (*Sq. tiburo*, L. and Val. loc. cit. xii. 2.) Marcg. 181. to be recognised by its head, in the form of a heart.—N.B. The tail of Bloch's figure is twisted, which has occasioned the error in the edition of Schn. p. 131. *Caudæ inferiore lobo longiore.*

[2] Ῥίνη in Greek, *Squatina* and *Squatus* in Latin. Ancient names of this fish preserved to the present day in Italy and Greece.

(angel-fish), with a rough skin, and small spines to the edges of the pectorals, Bl. 116 [1].

PRISTIS [2], *Lath.*,

Form a fourth genus. They unite to the elongated form of the squali in general, a body flatted in front, and gills pierced underneath, as in the rays. But their proper character consists in a very long depressed muzzle, in the form of the blade of a sword; armed on each side with strong osseous spines, pointed and trenchant, and implanted like teeth. This beak, from which their name is derived, is a powerful weapon, with which these fishes do not fear to attack the largest cetacea. The true teeth in their jaws are small and rounded, as in Mustelus.

The common species, *Pristis antiquorum,* Lath., *Squal. pristis,* L. (saw-fish), attains to the length of twelve or fifteen feet [3].

RAIA [4], *Lin.*,

Form a genus not less numerous than that of the squali. They are recognised by their body, flatted horizontally, and resembling a disk, in consequence of its union with the extremely ample and fleshy pectorals, which unite in front one to another, or with the muzzle, and which extend backwards, on the two sides of the abdomen, as far as the base of the ventrals; the shoulder-blades of these pectorals are articulated, with the spine behind the gills. The eyes and air-holes are at the dorsal face; the mouth, nostrils, and orifices of the gills, at the ventral face. The dorsal fins are almost always on the tail. Their eggs are brown, coriaceous, squared, with the angles prolonged into points. We subdivide them as follows:

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[1] Add *Squat. aculeata,* Dum. of the Mediterranean, a range of strong spines along the back. *Squat. Dumerilii,* Lesueur, Ac. Nat. Sc. Phil. I. x. with a granulated skin, &c.

[2] Πρίστις, a saw, the Greek name of this fish.

[3] List of species :—*Pristis antiquorum. Pr. cuspidatus. Pr. pectinatus. Pr. microdon. Prist. cirrhatus.* See Lath. Linn. Trans. vol. ii. p. 282. pl. xxvi. and xxvii. *Pristis semi-sagittatus.* Shaw, Russel, I. 13.

[4] *Raia* in Latin, Βατὶς and Βατὸς in Greek, are the ancient names of these fishes.

RHINOBATUS[1], *Schn.*,

Connect the rays to the squali, by their thick and fleshy tail, furnished with two dorsals and caudal, all very distinct. The rhomboid formed by their muzzle and their pectorals is sharp in front, and much less broad in proportion than in the ordinary rays. For the rest, they have all the characters of the rays. Their teeth are crowded in a quincunx arrangement, like little flat paving-stones.

In some, the first dorsal is still over the ventrals[2].

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[1] Ῥινόβατος, which Gaza translates by *Squatino-raia*, is the Greek name of these fishes, which the ancients believed to be produced by the union of the ray and the angel-fish.

[2] *Rhin. lævis*, Schn. 71. Russel, 10. and *Rh. Djiddensis*, Forsk. 18. which probably make but one species. It is to it that should be referred the figures of *Rhinobate*, Lacép. V. vi. 3. and that of Duhamel, Part II. Sect. ix. pl. xv.

In others, it is much farther back.

Such are the species of the Mediterranean, *R. rhinobatus*, L.; Will. D. 5. f. 1.

And that of Brazil, which has been said to participate in the properties of the torpedo, but in which the electric faculty has not been verified. *R. electricus*, Schn. Marcg. 152.

There is a species with granulated skin[1].

Rhina, *Schn.*,

Do not differ from the rhinobatus, but by having a short, broad, and rounded muzzle[2].

Torpedo[3], *Dum.*,

Have the tail short, and sufficiently fleshy. The disk of their body is almost circular, the anterior edge being formed by two productions of the muzzle, which stretch along the side to join the pectorals. The space between these pectorals and the head and gills is filled on each side by an extraordinary apparatus, formed of small membranous tubes, crowded against each other like the combs of bees, subdivided by horizontal diaphragms into small cells full of mucous matter, and abundantly supplied with branches from the eighth pair of nerves. It is in this apparatus that the electric or galvanic power resides, which has rendered these fishes so celebrated, and given them their name. They are capable of giving very violent shocks to those who touch them, and probably also make use of this method to stun their prey. Their body is smooth, their teeth small and sharp.

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[1] N.B. The *R. thouin*. Lac. I. 1—3. and that of Duhamel, is a variety of the common Rhinobatus. The *Raia halavi*, Forsk., appears to me likewise not to differ from it. Add *Suttivara*, Russel, XI.

[2] *Rhina ancylostomus*, Bl. Schn. 72.; the editor injudiciously unites to it the *Raie chinoise*, Lac. I. ii. 2. which, as far as we can judge by a Chinese figure, rather approaches to the Torpedos.

[3] *Torpedo*, *νάρκη*, ancient names of these fishes, derived from their benumbing quality.

We have several species of them, confounded by Linnæus and most of his successors, under the name of *Raia torpedo*[1].

Torpedo narke, (the numbing torpedo) Riss. Bl. 122.; Rondel. 358 and 362. Varies in the number of its spots from five to one; has no fleshy dentations at the edges of its air-holes.

Torp. galvanii, (the galvanic torpedo) Riss. Rondel. 363. 1. With seven fleshy dentations around its air-holes, and is sometimes of an uniform brown, sometimes marbled, or punctated, or spotted with blackish.

There are several others in foreign seas[2].

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[1] The *Torpille vulgaire à cinques taches. Torpedo narke,* Riss. Rondel. 358 and 362.

Torpedo unimaculata, Riss. pl. iii. f. 3.

T. marmorata, Id. Ib. f. 4. Rondel. 362.

T. galvanii, Id. Ib. f. 5. Rondel. 363. f. 1.

[2] *Temeree*, Russ. I. *Nallatemeree*, Id. 2. The *Raie Chinoise*, Lacép. I. ii. 2. One or the other is the *Raia timlei*, Bl. Schn. 359.

RAIA, *Cuv.*, (properly so called),

Have the disk of a rhomboidal form, the tail thin, furnished above, towards its point, with two small dorsals, and sometimes with a vestige of a caudal. The teeth are slight, and crowded in a quincunx form on the jaws. Our seas furnish several species, as yet but ill-determined by naturalists. Their flesh is eatable, though naturally hard and requiring much cooking to make it tender.

Raia clavata, (thornback) L., the male; Bl. 84. under the name of *rubus,* the female. One of the most esteemed, is distinguished by its roughness, and by the thick osseous oval tubercles, each furnished with a curved prickle, which irregularly bristle its two surfaces. Their number is very variable.

R. rubus, L. Lacép. I. v. (rough ray.) Differ from the preceding, by the absence of their thick tubercles. Both have, moreover, some crooked prickles on the front and angle of the fins in the male, and on their posterior edge in the female. The appendages of their males are very long and very complicated[1].

R. batis, L.; *R. oxyrhincus major,* Rondel. 348. (the skate.) Has the upper part of the body rough, but without prickles, and a single range of prickles on the tail. It is the species which attains the greatest dimensions. Some have been seen which weigh more than two hundred pounds. It is spotted in its youth, but assumes with age a paler and more uniform tint[1].

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[1] N.B. The *Raia batis,* Penn. Brit. Zool. No. 30. is nothing but this *rubus,* Lacép. The rubus of Bl. 84., which is the *R. clavata* of Will., is, if not a species, at least a variety, remarkable for some scattered tubercles above and underneath. There is also a marked variety, with an eye upon each wing. It is the *R. oculata aspera,* Rondel. 351.

In some species of rays, individuals have been observed, which have upon the middle of the disk a membrane raised in the form of a fin. Such was in the species *R. aspera*, the *Raie Cuvier*, Lac. I. vii. 1. I have also seen this in the species *clavata*.

PASTINACA,—TRYGON, *Adans*[2].,

Are recognised by their tail, armed with a prickle dentated like a saw, on both sides, and also by their teeth, all slender, and crowded in a quincunx form.

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[1] Add the *Raie ondée* (*R. undulata*), Lacép. IV. xiv. 2., which differs little or nothing from the *Mosaïque*, Id. Ib. xvi. 2 ; the *R. chardon* (*R. fullonica*, L.), Rondel. 356. represented under the name of *Oxyrhinchus*, Bl. 80., and Lacép. I. vi. 1 ; the *R. rudula*, Laroche, Ann. Mus. XIII. 321. is very much approaching it. The *R. lentillat* (*R. oxyrhinchus*), Rondel. 347. of which the *Raie bordée*, Lacép. V. xx. 2, or the *R. rostellata*, Risso, pl. i. and ii. *Læviraia*, Salv. 142. is a very neighbouring species. *R. asterias*, Rondel. 350., and Laroche, Ann. Mus. XIII. pl. xx. f. 13. *R. miraletus*, Rondel. 349. *R. aspera*, Rondel. 356.

Remark, that no regard must be paid to the synonymy given by Artedi, Linnæus, and Bloch, for it is in the most complete confusion, which principally arises from their having employed as the chief character the number of ranges of prickles to the tail, which varies according to age and sex, and cannot serve to distinguish the species. The character of sharp or blunt teeth is not much better, and is often doubtful in its application.

[9] *Pastinaca*, *τρυγὼν*, or turtle, ancient names of this fish.

Their head is enveloped, as in the ordinary rays, by the pectorals, which form a disk in general very obtuse.

Some have the tail slender, and scarcely provided with a fold in the shape of a fin; and in the number there are some with smooth backs. Such is

R. pastinaca, L. Bl. 82. (the sting-ray.) With round and smooth disk; it is found in our seas, where its spine or prickle is considered venomous, because its dentations render the wounds which it inflicts dangerous [1].

There are some also with the back more or less spiny [2].

Others have the back tuberculous [3].

Others have the tail furnished underneath with a broad membrane, and in this number is the species with the back furnished with osseous and crowded tubercles, *R. Sephen,* Forsk [4].

There is even one whose rounded body is altogether bristled with small prickles, and whose tail has tubercles like those of the back in *R. clavata,* (*R. Gesneri,* Cuv [5].)

But several have also the back smooth [6].

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[1] Add *Tenkée Shindraki,* Russ. i. 5.

[2] The *Raie tuberculée,* Lac. I. iv. 1. The engraver has forgotten the spine of the tail. *Raia Sabina,* Lesueur, Ac. Sc. Nat. Phil.

[3] *Isakurrah Tenkée,* Russ. i. 4.

[4] Add *Wolga Tenkée,* Russ. i. 3.

[5] There was only the figure of its tail, Gesner, 77.

[6] *R. lymna,* Forsk. p. 17. It is at least a species extremely approximating to it which is represented, but without a spine, under the name of *Torpille,* Lacép. I. vi. 1. and perhaps it is also the *P.*

There are some, whose tail, but little elongated, and tolerably thick, is terminated at the end by a fin [1].

Finally, in some the body is very broad, in consequence of the amplitude of the fins, and the tail very short [2].

ANACANTHUS, *Ehrenb.*,

Resemble Pastinaca ; but their tail, long and slender, has neither fin nor prickle. There is a species in the Red Sea, the back of which is furnished with a shagreen still larger than in the *Sephen*, and with star-like grains [3].

MYLIOBATIS [4], *Dum.*,

Have the head projecting from the pectorals, and the latter more broad transversely than in the other rays, which gives them somewhat the appearance of a bird of prey, with the wings extended, and has caused them to be compared to the eagle. Their jaws are furnished with broad flat teeth, arranged like the squares of a pavement, and of different proportions, according to

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grabatus, Geoff. Eg. Poiss. Bl. XXV. i. 1.—N.B. The *Lymne* of Lacep. I. iv. 2 and 3. is only a common pastinaca. *R. Jamaicensis*, Cuv. Sloane, Jam. pl. ccxlvi. f. 1.

[1] *La raie croisée*, Lacép. Ann. Mus. IV. lv. 2.

[2] *P. kunsua*, Cuv. *Tenkée kunsu*, Russel, I. 6. *R. maclura*, Lesueur, Sc. Nat. Phil. or *Micrura*, Bl. Schn. 360.

[3] The *Aiereba*, Marcgr. 176. (*Raia orbicularis*, Bl. Schn.) belongs perhaps to this subdivision.

[4] Μυλιόβατος, from Μύλη (a mill), in consequence of the form of their teeth. *Mourines* is their Provençal name.

the species ; their tail extremely narrow and long, is terminated in a point, and is armed, like that of Pastinaca, with a strong spine, serrated on both sides, and has above, towards its base, in front of the spine, a small dorsal. Sometimes there are two or more spines[1].

Some have the muzzle advanced and parabolic. *Raia aquila,* L. (the sea-eagle) ; Duham. Part II. sect. ix. pl. x. ; and the teeth, Juss. Ac. des Sc. 1721. pl. xvii[2]. Is found in the Mediterranean and the Ocean. It grows to a very large size. The plates of the middle of its jaws are much broader than long, in a single range. The laterals are pretty nearly in a regular hexagon, in three ranges[3].

Others (the RHINOPTERA, Kuhl.) have the muzzle divided into two short lobes, under which are two similar ones[4].

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[1] See the tail with five spines, Voyage de Freycin. Zool. xlii. f. 3.

[2] N.B. The fig. of Bl. 81. is by no means that of the Aquila. It is a pastinaca, to which a fin has been added in front of the spine.

[3] Add *Myl. bovina,* Geoff. Eg. Poiss. pl. xxvi. f. 1. *R. narinari,* L. Marcg. 75., and under the name of *aigle,* Lacép. I. vi. 2., and the teeth, Phil. Trans. Vol. XIX. No. 283. p. 673. *Eel tenkée,* Russ. I. 8. It is found in both hemispheres. *R. flagellum,* Schn. 73. His *R. Nieuhowii,* Will. App. X. *Mookarrah tenkée,* Russ. VII. does not differ from it, except in the spine having fallen. The teeth are as in the *Aquila. R. Jussieui,* Cuv., with the middle teeth broader than long, on three ranges. Juss. Ac. des Sc. 1721. pl. iv. f. 12.

[4] *Myliobatis marginata,* Geoff. Eg. Poiss. pl. xxv. f. 2. *Raia quadriloba,* Lesueur, Ac. Sc. Nat. Philad.

CEPHALOPTERA[1], *Dum.*,

Have the tail slender, the spine, the little dorsal, and the pectorals, extended in breadth, like Myliobates, but their teeth are still more slight than those of Pastinaca, and finely dentated. Their head is truncated in front, and the pectorals, instead of embracing it, prolong each of them their anterior extremity into a salient point, which gives to the fish the appearance of having two horns.

A gigantic species is sometimes caught in the Mediterranean, *Raia cephaloptera*, Schn., *Raie giorna*, Lac. V. xx. 3., with a black back, bordered with violet[2].

The CHONDROPTERYGII of the second family, or

THE SUCKERS;—CYCLOSTOMATA, *Dum.*,

Are, with respect to the skeleton, the most imperfect of fishes, and even of all vertebrated animals; they have neither pectorals, nor ventrals; their elongated body is terminated in front by a fleshy and circular, or semicircular lip, and the cartilaginous ring which supports this lip results from the union of the palatines and mandibularies. All the bodies of the vertebræ are traversed by a single tendinous cord, filled internally with a mucilaginous substance, which undergoes no strangulations, and reduces them to the condition of cartilaginous rings, scarcely distinct one from the other. The annular part, though a little more solid than the rest, is not, however, cartilaginous in its whole circuit. No ordinary ribs are visible, but the little branchial ribs, scarcely sensible in the squali and the rays, are here very much developed, and united to each other, to form as it were a sort of cage, while there are no solid branchial arches. The gills, instead of forming combs, as in most other fishes, present the appearance of pouches, resulting from the union of one of the faces of one gill, with the opposite face of the neighbouring gill. The labyrinth of the ear of these fishes is enclosed in the cranium; the nostrils are opened by a single hole, in front of which is the orifice of a blind cavity[1].

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[1] *Cephaloptera*, winged head, in consequence of the productions of their pectorals.

[2] *La Raie fabronienne*, Lac. II. v. 1, 2. is probably but a mutilated individual of the *Giorna*, but the *R. giorna* of Lesueur, Ac. Sc. Nat. Phil. appears different from that of the Mediterranean, and may rather be the *Mobular*, Duham. Part II. Sect. ix. pl. xvii. As for the *R. Banksienne*, Lac. II. v. 3., *Manatia*, Id. I. vii. 2. *Diabolus marinus*, Will. App. IX. 3., it is unfortunate that they do not rest upon very authentic documents.

Add, the *Cephalopteram assena*, Riss. pl. xv.; *Eregoodoo-tenkée*, Russ. I. 9.

Their intestinal canal is straight and narrow, with a spiral valve.

PETROMYZON, *L.* (*The Lampreys*[2].)

Are recognized by the seven branchial apertures which they have on each side. The skin is raised, above and under the tail, into a longitudinal crest, which holds the place of a fin, but in which the rays are only observed, as fibres scarcely sensible.

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[1] This is what authors erroneously name air-hole. See in general on this family, Dumeril, Diss. sur les Poiss. Cyclostomes.

[2] *Lamprey*, *Lamproie*, *Lampreda*, are names corrupted from *Lampetra*, which itself is modern, and derived, as some writers

PETROMYZON, *Dumeril.* (*Lampreys,* properly so called)

Their maxillary ring is armed with strong teeth ; and tubercles, invested with a very hard shell, and similar to teeth, furnish more or less the interior disk of the lip, which is very circular. This ring is suspended under a transverse plate, which appears to hold the place of the intermaxillaries, and at the sides of which we see some vestiges of the maxillaries. The tongue has two longitudinal ranges of small teeth, and is carried backward and forward like the sucker of a pump, which serves the animal to perform the operation of suction which distinguishes it. The water comes from the mouth to the gills by a peculiar membranous canal, situated under the œsophagus, and pierced with lateral holes, which may be compared to a trachea. There is a dorsal in front of the anus, and another behind, which unites to that of the tail. These fishes have the habit of fixing themselves by suction to stones and other solid bodies ; by the same means they attack the largest fishes, pierce and devour them.

think, from *Lambendo petras.* *Petromyzon* is the Greek translation of this made by Artedi. It is singular that any uncertainty should exist respecting the ancient name of a fish so much esteemed, and so common in the Mediterranean.

Petromyzon marinus, L. Bloch. 77. The teeth better, Lacép. I. i. 2. (The Great Lamprey.) Two or three feet long, marbled with brown, on a yellowish ground. The first dorsal very distinct from the second. Two thick teeth approximating at the top of the maxillary ring. In spring, it ascends into the mouths of rivers. It is an eatable much esteemed.

Pteromyzon fluvialis, L.; Bl. 78. 1. (River Lamprey.) From one foot to eighteen inches in length, silvery, blackish or approaching an olive colour on the back; the first dorsal very distinct from the second; two thick teeth, wide apart, at the top of the maxillary ring. It is found in all fresh waters.

Petr. planeri, Bl.; Gesner. 705. (Little River Lamprey.) Eight or ten inches long; the colours and teeth of the preceding; the two dorsals contiguous or united. It also inhabits our fresh waters [1].

MYXINE, *L.*

Have but a single tooth at the top of the maxillary ring, which itself is altogether membranous, while the lateral dentations of the tongue are strong, and disposed in two ranges on each side, so that these fishes have the appearance of having only lateral jaws, like the insects or the nereides, which caused them to be ranged by Linnæus in the class of worms. But all the rest of their organization is analogous to that of the Lampreys[1]; their tongue performs in the same manner the office of a piston, and the dorsal spine is also in the form of a cord. The mouth is circular, surrounded with eight barbels, and at its upper edge is pierced an air-hole, which communicates with its interior. The body is cylindrical, and furnished behind with a fin, which surrounds the tail. The intestine is simple, and straight, but wide, and folded internally. The liver has two lobes. We find no traces of eyes. The eggs grow to a large size. These singular animals shed through the pores of their lateral line such an abundance of mucous matter, that they appear to convert into jelly the vases in which they are kept.

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[1] N.B. The fig. of the *Planeri*, Bl. 78. 3. is but a young *fluvialis.* On the contrary, I think that the *Petrom. sucet.* Lacép. II. i. 3., *Sept-œil,* IV. xv. 1., *Noir,* Ib. 2. are only varieties of the *planeri.* But the fig. I. ii. 1., under the name of *Lamproyon,* (*Petrom. branchialis*) represents a particular species of this genus, and not an *Ammocœtes.* I see no certain difference between the *Petrom. argenteus,* Bl. 415. 2. and the *fluvialis.*

They attack and pierce fishes like the Lampreys.

They are subdivided according to the external orifices of their gills.

In

HEPTATREMES, *Dum.*,

There are still some holes on each side, as in the Lampreys.

But one is known, from the South Sea, *Gastro-*

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[1] See the Memoir of Abildgaart, Ecrits de la Soc. des Nat. de Berlin, tom. x. p. 193.

branche dombey, Lac. I. xxiii. 1. *Petromyzon cirrhatus,* Forster, Bl. Schn. p. 532[1].

In

GASTROBRANCHUS, *Bloch.,*

The intervals of the gills, instead of having each its particular issue externally, open into a common canal for each side, and the two canals end at two holes, situated under the heart, towards the first third of the total length.

But one is known, of the North Sea, *Myxine glutinosa,* Linn., *Gastrobranchus cæcus,* Bl. 413.

AMMOCŒTES, *Dum.,*

Have all the parts which should constitute their skeleton so soft and membranous, that they might be considered as having no bone whatever. Their general form and the exterior holes of the gills are the same as in the Lampreys, but their fleshy lip is only semi-circular, and covers only the upper part of the mouth; accordingly, they cannot fasten themselves to bodies, like the Lampreys, properly so called. It is impossible to perceive any teeth, but the aperture of their mouth is furnished with a range of little branchial barbels. They have no particular trachea, and their gills receive the water through the œsophagus, as usual. Their dorsals are united together, and to the caudal, in the form of a low and sinuous fold. They remain in the mud of streams, and have a great deal of the habits of the worms, which they resemble so much.

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[1] See the Article of Sir Everard Home in the Phil. Trans. of 1815.

We have one named

Petrom. branchialis, L. (*Lamprillon*, *Lamproyon*, &c.) Six or eight inches long, about as thick as a stout quill, which is accused of sucking the gills of fishes, perhaps because it is confounded with the *Petrom. planeri*. It is employed as bait in hook-fishing.

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[1] See *Omalius de Hallois*, Journ. de Phys. Mai, 1808. N.B. The *Petrom. rouge*, Lac. II. i. 2. is of this genus; perhaps it does not differ essentially from the common *Lamprillon*.

SUPPLEMENT

ON THE

CHONDROPTERYGII.

ORDER I.—STURIONES.

The second series of this class of animals, or the cartilaginous fish, begins, as we have seen, with the Sturiones, or Sturgeons, or those with the gills unattached on the outer edge, with a common opening as distinct from the sharks, and having the exterior edges of the gills attached to the flesh, with the water passing through them, and out at several distinct openings.

The sturgeon in outward form a good deal resembles the sharks, but instead of teeth, the former possesses merely a hard cartilage on the jaws, which, with the small size of the mouth, unfits these fish for any great predatory exertions. The mouth moreover is capable of some elongation and contraction, but is small and purse-like. Their disposition, in conformity with their want of power, notwithstanding their great size, is consequently and by comparison, gentle and unoffending. The barbels attached to the mouth are very slender, mobile, and vermiform; and it is even said, that sturgeons have a habit of lying concealed in the mud and weeds, leaving only their wormlike barbels visible, to attract the attention of small fish, which, on approaching these supposed worms, find themselves in the jaws of the sturgeons.

The operculum is marked by a number of concentric striæ, and the body is armed with five series of hard tubercles, terminating in a spine more or less obtuse, but bent.

The sturgeon is found almost every where in the main ocean, as well as in the circumscribed and narrow seas; and at certain times of the year, in all the larger rivers; sometimes even it is found wandering in tributary streams, at considerable distances from the tide-rivers or the sea. They are sometimes found in the Thames, but more commonly in our northern rivers, especially the Eden and the Esk; in which latter river one was caught a few years ago, which weighed 460 pounds. The common sturgeon, though not so large as another species we shall have occasion to mention, attains to a great length; the ordinary size, however, as found in our rivers, is about six feet, and it is remarkable that they are seldom taken very small or young, whence it has been presumed, that the young, as soon as they escape from the eggs, which the female deposits up the river, descend immediately to deep water in the sea, and do not visit the places of their birth again, till they come in their turn to deposit their eggs.

It is in the rivers of the northern parts of Europe that these fish most abound, especially in March, April, and May. They enter then in shoals so abundant, as to produce a visible effect on the surface of the water. Pallas was informed, that they have been in such numbers in the Jaïck, as to endanger the embankments made in that river; and that it has been thought necessary to frighten them back, by discharge of cannon. They appear to be more rare in the rivers of Siberia, which are of great rapidity, and have a stony bed. They are found more or less, not merely in the rivers of Northern Asia, but in those which fall into the

Caspian Sea, in Persia, and the South of that immense continent. Nor are they confined to the old world, as they appear to be as abundant in the rivers of North America as elsewhere.

The sturgeon seems to require migration from salt to fresh water, and back again; at least, it has been observed, that those which have been caught and confined to one lake or part of a river when young, do not grow and acquire fat like the others; a muddy bottom seems to suit them best, and they are very seldom caught in the open sea.

This fish ranks among the largest of its class, sometimes attaining thirty feet in length; and it is said, that in Norway they sometimes weigh 1000 pounds. Notwithstanding their vast dimensions, however, they feed only on smallish ill-armed fish. In the sea, or near the mouths of rivers, they live principally on herrings and mackerel. In the rivers, they attack salmon, and as they are frequently found in company with these fish, they have been called the salmon's guide. They seem, however, to feed most on worms, and to disturb the muddy bottoms of rivers, in which they delight, something in the manner of hogs with their snout, in search of the small animals which abound there. Gesner thinks, that it is to this habit they owe their name, for the Germans call them *Stör*, and the verb *stören* signifies to dig the mud. There is a popular notion in Germany, that they live on air alone, attributable perhaps to the smallness of their mouth, and a German proverb compares very sober persons to sturgeons.

The fishermen of the Danube harpoon the sturgeon while sleeping on the sand or mud. Those of the river Po pursue the fish in three or four boats, driving them gently into shallow water, when they suddenly set up a great shout, and the frighted fish run directly aground.

A great number are taken in the Volga during summer and autumn, and are then transported into lakes near that river, for which purpose the fish are frequently drawn after they are caught considerable distances in the river, by means of a rope passed through the mouth and gill. At the beginning of winter they are taken out of the preserves by nets, and are then sent in a frozen state into the different provinces. The cossacks of the Jaïck are obliged by law to return into the water all the sturgeon which fall into their nets during the month of May, because these fish fetch a much higher price during winter, when they can be transported in a frozen state.

The sturgeon is much esteemed for food, and is said to eat like veal. The male fish is the best. This fish seems however to have been more highly prized in former times than at present. It was in great request among the luxurious Romans and at Athens. In China, at the present day, sturgeons are considered the exclusive property of the emperor, and in France and England are treated as royal fish; and we have still a provision on the statute book, of the period of Edward I., that the king's escheater shall make diligent inquiry whether any sturgeon have been taken and withdrawn from the crown. The most profitable part of this fish to the fishermen is the roe, which is salted and preserved, and exported almost all over Europe, under the name of *caviar*.

The *hausen*, or great sturgeon, *acipenser huso*, of Linn. and the text, is not so extensively spread in the different temperate seas of Asia, as the common species; it is found only in the Caspian Sea and the Euxine, and is observed to visit only the Volga, the Danube, and the other rivers which run into those seas; but it is much more numerous in these waters than the common species. Husen is the German name of this fish. In Russia it is called *Beluga*, and various other names, according to the size of the individual, which varies very considerably, as it is sometimes found twenty feet in length.

The great sturgeon deposits its spawn early in the spring, and for that purpose ascends the rivers with the common sturgeon, in the middle and latter part of winter, while these remain frozen. The eggs are deposited in surprising numbers in stony places, where the current is most rapid. After spawning, they return to the sea, and the young seem to follow almost as soon as they quit the egg, few or none being found in the rivers during the winter and autumn. It is more voracious than its common congener, and attacks not merely all fish that are not too large for its limited mouth, but also water-birds, &c.; besides which, it eats water plants, and is said to grub them up by the roots in the manner of hogs.

This fish seems to suffer from the extreme cold of the latitudes it inhabits; as in the depth of winter many of them get together into holes and cavities in the banks, in which situation they may possibly preserve something more of the little animal heat they possess. Here they take but little food, and according to the fishermen, they then suck and lick the viscous humour exuded from each others' bodies.

It is more especially with the eggs of the females of this species, that the inhabitants of the countries where the sturgeons abound prepare the caviar before mentioned, which is more or less esteemed, according to the quality of the materials of which it is made, and the method of making; that from the *acipenser ruthenus* of Lin. being the best, but that from the species now under consideration the most abundant. We need not be so much surprised at the profusion with which this food is spread over the northern parts of the old world, when we consider the extraordinary dimensions of this fish, and the still more extraordinary dimensions of the roe of the female, weighing nearly one-third of the entire fish. This caviar is principally used, however, in Turkey, Russia, Germany, and Italy. It constitutes almost the entire food of the Greeks during their long fasts, and affords a great revenue to Russia. The fish is valuable moreover not merely for its eggs; the flesh is white, fat, and a good deal like veal, and is very nutritious, wholesome, and agreeable to the taste.

Nothing is known relative to the habits of that singular fish, which alone at present constitutes the genus SPATULARIA of Shaw, POLYODON, Lacép., and its external characters are sufficiently detailed in the text. It is, however, impossible to convey by words even a notion of this, as well as many other oddly-formed species of this class. The subjoined figure is therefore inserted in aid of the verbal description already given. It does not in general much exceed a foot in length, and is of a uniform greyish colour.

THE CHONDROPTERYGIANS WITH FIXED GILLS.

We proceed to the chondropterygian fish with fixed gills, the first family of which includes the large genus SQUALUS, of Lin., the Sharks, now divided into several subgenera, with reference to the air-holes on the neck, the single post-anal fin, the disposition of the head, muzzle, teeth, &c.; and the Rays.

The mode of generation in these fish, singular for the class, though common in the other great divisions of the animal kingdom, has been already alluded to in the text. The several species are ovoviviparous, that is, the eggs are hatched in the matrix or oviduct of the mother; but it sometimes happens, that these eggs are expelled before the embryo has quitted them, which it seems, however, does not destroy the young, which in due time will quit its singular covering.

The sea-coasts abound with these eggs, and those of the rays, both commonly called sailors' purses. That of the shark generally forms a parallelogram, in the shape of a little pillow of a tough coriaceous texture, more like vegetable than animal matter, of the colour of horn, with a long curling filament issuing from each angle.

Though on opening these animals, a number of eggs are usually found of different sizes, each pair of them seems to require a separate fecundation from the male, two only being produced at each parturition. When ripe for exclusion, each fœtus is coiled up, and attached by a thread-like membrane to a sub-oval white substance, and both fœtus and attached substance are inclosed in the purse, which is not unlike a pea-pod, but more regular; the long tendrils from each corner of this purse, slender, tough, elastic, and like Indian grass, seem to be for the purpose of catching hold of fucus, sea-weed, or any like substance, so as to detain it from too much motion in the water; and thus, when the young is born before exclusion from the purse, it is safely preserved till the period for it to quit its domicile arrives. On first quitting the purse, the oval body or egg to which it is attached, and by which it is nourished in the fœtal state, drops off, and the young shark is obliged to seek his own sustenance in the ordinary way.

The *Squalus canicula* of Lin. is found in almost all seas. Its voracity is extreme, following ships, and seizing with avidity every thing that may fall or be thrown overboard. Fish, however, form its ordinary food, of which it destroys a vast number; but it will sometimes attack fishermen themselves, or those whom it may find bathing. Like the felinæ among mammalia, it generally attacks by surprise, in preference to open warfare, lying in ambush in the mud or weeds for its prey.

The skin, when dried, forms an article of commerce, and is used by turners and others for polishing wood, and even metals, which it effects by the numerous small stony tubercles which cover the skin. It is also sometimes used as a covering for boxes, watch-cases, &c., under the name of shagreen. The liver furnishes a considerable quantity of oil, but it is apt to be deleterious, so that the fishermen generally extract it before they sell the fish. Professor Sauvage, of Montpellier, relates, that a man, his wife, and two children, after partaking of the liver of this fish, all fell into a sort of swoon, and did not recover their faculties for three days; and it was stated in the public papers, in July, 1802, that seven of the crew of the *Reward*, from Jamaica to London, died on the passage, in consequence of eating the liver of this shark.

The *Scyllium (Squalus catulus*,, Lin.) called the *Bounce*, or *Morgay*, on some parts of our northern coasts. The *lesser spotted dog-fish* of Pennant, notwithstanding this epithet, and that of *Petite Roussette*, to distinguish it from the last, appears to be as large, if not larger, than the last mentioned. This species lives in the mud and algæ, at the bottom of the sea, and feeds principally on mollusca, crustacea, and fish. The female produces about twenty at a birth. Its flesh is more edible, or rather is less disagreeable, than that of the last-named species.

The subgenus CARCHARIAS includes *S. carcharias*, or the *White Shark*, the most terrible of its kind, found occasionally in the British seas. The head of this formidable animal is flat, the muzzle round, the pectoral fin very large, the skin covered with tubercles extremely hard, and of a grayish brown cast. The mouth opening under the muzzle is very deeply cleft, transversal, and forms, when open, a circumference about equal to one-third the length of the fish. The body is elongated, reaching upwards of thirty feet in length. The eyes are extremely small, and near the mouth.

The teeth form each a sub-isosceles triangle, with the edges slightly jagged. The nostrils are greatly developed, and the faculty of smell seems to be very perfect, and, according to Lacépède, enables the animal to discover its prey at a considerable distance, and to distinguish it when the sea is greatly agitated by storm, or even in the darkness of night or obscurest depth of the ocean. By this faculty the shark regulates his movements, and directs his attack; and the singular fact related by so many travellers, that this shark will take a black man and leave a white, when both are bathing together, or otherwise in his power, may be referred to the perfection of the sense of smell, especially as it seems to be certain, that the emanations from a negro are more odoriferous than from a white.

A mouth ten feet in circumference can of course take in very large animals, and the throat seems to be capable of considerable distension in swallowing. Brunnich writes of one killed near Marseilles, in the stomach of which, besides several whole fish, was found the entire body of a man; and Captain Brun relates, that at Surinam one was opened, in which was found the body of a woman entire, except only that the head was severed from it. Muller states, that one was taken off the island of St. Margaret, which weighed 1500 pounds, and that the stomach contained the whole body of a horse, which had probably been thrown overboard from some ship.

The boldness of this animal is equal to its power, and, accordingly, we are told by Sir Charles Douglas, and the fact is confirmed by many naval officers, that little alarmed by the noise and turmoil which attends a general naval engagement, the shark may be seen attacking the unhappy wretches whom the destruction of the ship or accident has thrown into the sea.

The French name this terrible animal *Requin*, from requiem, the rest or stillness of death, in allusion to the deadly character of its habits; and when we consider its enormous size and powers, the strength and number of its teeth, the rapidity of its movements, its frequent appearance during all the turmoil and horrors of a tempest, with death and destruction apparent in every blast and every wave, to add to the horror of the scene by the phosphoric light emitted from its huge body near the surface of the troubled waters, with its open mouth and throat ready to swallow entire the despairing sailor, we must admit the propriety of a name, expressive of that natural association of ideas, which connects this cruel monster of the deep with death.

The story of Sir Brock Watson, far from singular in its kind, but much more remarkable for the escape of that gentleman from total destruction, is almost trite by repetition. He was bathing from his ship, when a shark came in sight, and though a rope was almost instantly thrown to him, by which he was hauled up the ship's side, the fish darted at him, and at a single bite took off one of his legs.

The teeth of a white shark, of from thirty to five-and-thirty feet long, are about two inches and a half in length from the jaw; they are extremely white, and cuspidated and serrated on the edges; their number seems to increase with the age of the animal. When young, but a single row of them is seen, and they are comparatively weak; but when adult, there are six distinct ranges of them. Each tooth is moveable, and appears, something like the fangs of the venomous snakes, to be capable of a partial erection when in action, by means of muscles placed at the base: they are not inserted in alveoli in the jaws, but are simply lodged in membranous cells. The inner range of these teeth is the last formed, and does not attain to the size and strength of the outer row, till the animal has arrived at its full growth: these inner teeth are directed backward, and their office is doubtless more to retain the prey in the mouth, than to lacerate or masticate it. It has been thought, that they were destined to supply the place of the outer and more effective range, when injured or destroyed, but this is not probable.

The white shark is common in almost all seas, as ferocious, greedy of blood, and insatiable of prey, as the tiger, and on these accounts is more fearful than the largest cetacea. Its voracity and eagerness in pursuit of its prey is so great, that it will sometimes run in the pursuit on shore; it swallows so greedily, and is so impatient to pass its half-digested food, to make room for more, that, as Commerson observed, the intestines are frequently forced out a considerable distance from the anus. So great indeed is the gluttony of this animal, that, as Vancouver relates, when harpooned, and no longer able to defend itself, it is sometimes torn to pieces by its companions.

Seals, and tunny, cods, and other fish, form the ordinary food of the white shark; but it will also take cuttles and other mollusca; and, like the vultures on land, they are observed to be attracted from considerable distances by the smell of putrescent animal matter of all sorts. The revolting horrors of the slave-trade have been increased by these fit companions of human bloodhounds and murderers, following the slave ships from the African shore the whole voyage across the Atlantic, to devour the bodies of such of the miserable blacks whose sufferings might terminate in death during the passage. Commerson states, that a shark has been known to spring from the water to a height of twenty feet, to seize a human body suspended for the purpose by a line.

It has been said, that the white shark is obliged, in taking its prey, in consequence of the opening of the mouth under the projecting muzzle, to turn in the water either on its back or side, but the truth of the assertion seems to be questionable.

In common with their congeners, these fish, unlike most of the class, have a personal intercourse between the sexes, which takes place at the beginning of the hot season, according to the latitude where they may be at the time, and not very far from shore. The eggs in considerable numbers are hatched in the mother, but not all at the same time, part toward the end of summer, when a parturition takes place of three or four, and so from time to time, till about thirty are produced. It appears that a shark of about ten feet long contains about forty eggs or young. At its birth the young shark is about seven or eight inches long, and it is quite unknown how long they are in attaining their full size, or what is the usual period of their life.

The principal enemies of this formidable fish appear to be the cetacea, especially the cachalot, with whom however the shark engages in sometimes long and dubious combat. They are also tormented by a vast number of intestinal worms.

The Carcharias, (Squalus Vulpes,) the *Thresher or Fox Shark*, frequents our coasts, and is a very large species, being sometimes found fifteen feet long. It is called the fox from the length and roughness of its tail, and according to Borlase is called the thresher from its habit of defending itself by blows of the tail. It is an inhabitant of the Mediterranean as well as of the ocean.

From Col. Hamilton Smith, we have received the following communications, respecting these fishes.

Sharks are said to be innocuous in certain estuaries on the Western Coast of Africa, where no dead bodies are allowed to be thrown into the water, while in others, they are so voracious as to leap out of the sea to catch their prey. The colonel himself has seen sharks so eager as to run ashore and struggle in the surf until they were washed back again, or knocked upon the head.

When Colonel Smith was in Jamaica, the Captain of a

West Indian vessel happened to be upset in his boat, along with two boys, about two miles distant from the land of Montego Bay. This occurred in the night, and the three, with the aid of an empty keg, and billets of wood, betook themselves to swimming. The boys soon disappeared, one after the other, and the master, from the length of time during which he had remained in the water, became quite exhausted and drowsy. From this state he was suddenly, and not very agreeably roused, by a tremendous blow on the breast, proceeding from a shark which darted against him from below. The man defended himself with his billet of wood, and fought with the monster for a long time, until at last he was heard from the shore, by some negro watchman, who went with a canoe to his assistance, and brought him to land. The Colonel believes, that he had then about forty wounds, but had lost no limb. This escape was attempted to be explained by the probable conjecture that the shark had already devoured the two boys, and had therefore become too unwieldy to bite with sufficient effect. The wounds, indeed, were mostly cuts inflicted with the fins of the fish. The Colonel visited the estate where the captain had been cured, a few days after his departure, and learnt the circumstance from the medical resident who had attended him.

In Roseau Roads, Island of Dominica, Colonel Smith once saw a shark driven off by four swimmers, who plunged into the sea, from the deck of the vessel on which he was aboard, to rescue a drunken sailor who had fallen from a wharf, and lay floating in the water. When a shark enters Curaçoa harbour, all the negro women plunge in together, and chace him until he either escapes back to sea, or is driven ashore and destroyed. The colonel had the opportunity of witnessing a feat of this kind, on two occasions.

Our contributor received the following information from Captain Richards of the Royal Navy, a gentleman whose veracity is unimpeachable, and whom the colonel knows to be a correct observer. He informed the colonel, that during his last station in the Mediterranean, on a fine day, a blue shark followed the ship, attracted, perhaps, by a corpse which had been committed to the waves. After some time a shark-hook, baited with pork, was flung out. The shark, attended by four pilot-fish *(Scomber ductor)*, repeatedly approached the bait, and, every time that he did so, one of the pilots preceding him, was distinctly seen, from the taffrail of the ship, to run his snout against the side of the shark's head, to turn it away. After some further play, the fish swam off, in the wake of the vessel, his dorsal fin being long distinctly visible above the water. When he had gone, however, a considerable distance, he suddenly turned round, darted after the vessel, and, before the pilot-fish could overtake him, and interpose, snapped at the bait, and was taken. In hoisting him up, one of the pilots was observed to cling to his side, until he was half above water, when it fell off. All the pilot-fishes then swam about awhile, as if in search of their friend, with every apparent mark of anxiety and distress, and afterwards darted suddenly down into the depths of the sea. The colonel believes these observations on the pilot-fish to be perfectly correct, as he has himself watched with intense curiosity, an event in all respects precisely similar to the one now related.

A circumstance still more curious is noticed by Col. Smith, and one, he thinks, hitherto unremarked in ichthyology. Sometimes whole armies of these large fish are driven on shore, by some cause not yet satisfactorily explained. Several instances have occurred, of cetacea being stranded in this manner, and occasionally, in very considerable numbers. The same incident has taken place with regard to sharks. A few years ago, so vast a shoal of sharks ran on shore in St. Helena Bay, Cape of Good Hope, that Lieutenant Peddie, of the Royal Navy, obtained from them eighteen leaguers of sharks' oil, each leaguer containing 182 gallons, and he might have obtained a much greater quantity, had he been provided with a sufficient means of extracting it. A similar occurrence took place, many years back, in Table Bay, and it is said, that on both these occasions, the sea had previously appeared of a red colour as seen from the beach[1].

The white shark, which is cosmopolite, ferocious, and the tyrant of all seas, must not be confounded with the *Squalus maximus* of Linnæus, the *basking shark*, which is not less in dimensions than the white shark, but is confined to northern latitudes, except occasionally when it visits the coasts of these islands, and sometimes the north coast of France. The branchial apertures across the neck distinguish it generally. It is ovoviviparous, and frequently swims so near the surface as to have the dorsal fin above water, and hence becomes the more easily a victim to the harpoon. According to Pennant, this species, which at present stands alone in its genus, distinguished by the branchial apertures nearly surrounding the neck, is well known on the south and west coasts of Ireland and Scotland, and those of Caernarvonshire and Anglesea. They quit the bays of these Welch counties about Michaelmas, and the Firth of Clyde and the Hebrides about July. They have little of the fierce and voracious nature of the sharks

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[1] Dimensions of a shark caught at Alexandria in 1827 :—

Extreme length	17 feet	10½ inches
Circumference of the large part of the jaw-bone	1	8
Do. small part of do.	1	0
Spread of the jaws when extended	2	11½
Length of the back-bone when dried and cleaned	9	1
Circumference of the back-bone		10¾

Inside this fish the body of a man in a perfect state was found, and one half of another in a state of decomposition.

in general, but are so tame as to suffer themselves to be touched lying motionless on the surface of the water, as if to sun themselves, whence they are called basking sharks. A large fish will yield eight barrels of oil. When struck with the harpoon and wounded, they fling up the tail, and plunge headlong to the bottom, coiling the harpoon rope round them, and attempting to disengage themselves from it by rolling on the ground. They then swim away with such rapidity and violence, that they have been known to tow a vessel of seventy tons burthen against a fresh gale, and they will employ the fishers for twelve, and sometimes twenty-four hours, to subdue them.

The *Squalus centrina* of Lin., *Centrina vulgaris*, Cuv., and *Squale humantin* of Lacépède, is very remarkable in its appearance, having the spines in the dorsal fin, which distinguish it generally in the modern system, one directed forward and the other backward. Its shape is a subtriangular prism, the belly forming one of the three sides. It inhabits the Atlantic and the Mediterranean, but its flesh is so hard and stringy, that it is almost impossible to eat it. It lives at the bottom of the water, in the sand or mud, and is hence called by fishermen the *sea-hog*.

No animal is perhaps more singular or remarkable, especially of the larger sort, than the *Squalus zygœna* of Lin., the *hammer-headed shark*, the type of the genus ZYGŒNA of our author. The head is flatted horizontally, truncated in front, with each side elongated into a branch, like a double-headed hammer, or the letter T. The eyes are large, prominent, and lodged at the extremities of these branches of the head, which are also pierced by the nostrils at their anterior edge. The opening of the mouth is semicircular, the teeth are large, sharp, indented on each side, with three rows in each jaw.

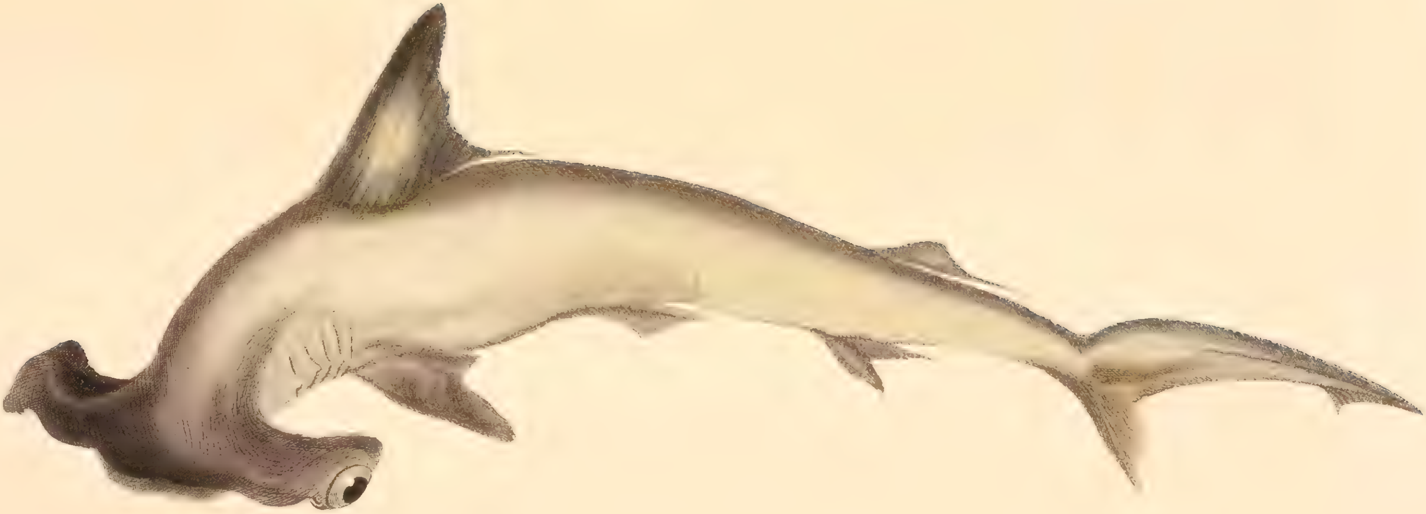
This fish inhabits most of the southern seas, is of a gray colour, with the head nearly black, the eyes are yellow, with a black pupil. It frequents deep water rather than the shore. It attains twelve or fifteen feet in length, and then weighs five hundred weight. The flesh is coriaceous, and scarcely eatable, but the liver affords a considerable quantity of oil. Like most sharks, it is voracious, and is said to be dangerous, even to man. It feeds principally however on the rays.

The female, which is ovovivaparous, produces ten or twelve at a birth.

We insert the figure of a species of *Zygœna,* taken off the south coast of New Holland. It appears to differ from the common species in the caudal fin, which, according to the drawing, is divided into two lobes, much more unequal; the anterior lobe nearly as large as the first caudal, the second forming a slight fringe under the tip of the tail.

The genus SQUATINA appears almost intermediate between the sharks and the rays. The *Squalus squatina* of Lin., the *Monk-fish*, and the *Angel-fish,* of the English, derives those names from the fancied similarity of the head to a monk's cowl, and of the pectoral fins to an angel's wings; these are extremely large, and shaped like half-extended wings; the muzzle is wider than the body, and appears to be attached by a sort of neck; the head is large, round, and depressed, with the mouth, unlike that of sharks in general, opening in front, and not under a snout. The teeth are sharp, bent, forming two rows, and appear to increase in number with the age of the fish. The nostrils are covered with a membrane like barbels.

This fish inhabits the Mediterranean, and is described by Aristotle under the name *ρινη* (a file), with reference doubtless to the use made of its skin, in common with that of most sharks, at the present day, to polish wood and other substances. It is gray above, and white underneath, but the pectoral fin edged with brown underneath. It attains eight feet in length, and sometimes is found weighing 160 pounds;



Zygæna Lewini.

hence it is very formidable, and though it grovels in the sand and mud at the bottom, feeding on the rays, soles, and flat fish, which resort thither, it will not hesitate on occasion to attack a man. It is gregarious in its habits. The female ovoviviparous, produces about twelve young ones at a time, which, on the approach of danger, according to Rondelet, save themselves in the throat of their mother. The flesh is no more edible than that of the other sharks. It is sometimes found on our coasts.

The *Saw-fish*, *Pristis*, whose internal organization is very like that of the white shark, have been nevertheless classed with the whales, principally on account of a certain similarity to them in outward form.

The common sawfish has its elongated beak armed like a rake, with eighteen or nineteen spines on each side, covered with a sort of corium. The beak is about one-third the length of the fish, and becomes narrower towards the end, which is not sharp, but almost rounded or subquadrate. The fish is of a deep gray colour, or nearly black, with the sides ashy, and the belly almost white. The skin is covered with tubercles, whose point is turned towards the tail. The pectoral fins are very large.

This fish, which attains fifteen or eighteen feet in length, frequents almost all the seas of both hemispheres, and is found as well under the ice of the polar regions, as under the burning atmosphere of a vertical sun, on the coasts of Africa and Bengal, near Spitzbergen, and off South America. Its strength and courage distinguish it as much as the formidable serrated weapon with which it is armed. It appears indeed to have a natural antipathy to the cetacea, and will attack and frequently beat the largest whale, which could almost annihilate the sawfish by a single stroke of the tail, did not the agility of the latter save it from such a fate. These combats have been often spoken of, and all who have witnessed them represent the obstinate courage of this fish, which, uniting agility to strength, springs out of the water to escape the tail of the whale, and falling on it again, pierces the whale's back with its formidable weapon, and tinges the sea with its blood.

The beak of the sawfish, like that of the sword-fish, has been found driven into the timbers of a ship, both animals, in all probability, taking the moving mass for the body of a whale.

Of the next genus, the RAYS, we shall pass over the subgenera RHINOBATUS and RHINA, as affording no other matter of information, than what is connected with their physical characters, and proceed to those singular fish, the Torpedos.

For many ages the torpedo has been known to possess the surprising quality alluded to. Plato, in one of his dialogues, is supposed to say to Socrates, "You stun me with your objections, like the torpedo, a flat sea fish, which stuns those who touch it." At the present day, as in ages past, this fish is the object equally of terror and wonder to the vulgar; and its reputation is so extensively spread among even the least informed of mankind, that the nature of its qualities, true or false, has become the subject of various proverbs.

The genus TORPEDO includes several species, but we shall confine our observations to the *T. narke*, Riss., or the common torpedo; which, in addition to the characters indicated in the text as common to the genus, is of a yellowish red colour, with five large round spots, of a grayish blue, surrounded with a large brownish circle, and a number of whitish dots; the under side is grayish white. The head is scarcely distinguishable from the body, and is terminated laterally by two processes, which join the pectoral fin. The upper opening of the air-vents is surrounded with a folded and indented membrane, and there is an infinity of minute pores, from which a mucus is exuded along the vertebral column. The teeth are very short. The torpedo does not attain the dimensions of some of the rays, as it is seldom found exceeding sixty pounds in weight, and the largest on record, as caught on our coast, was four feet long and two and a half wide.

It is by no means common on our coasts, but is found more abundantly in the Mediterranean, on the western coast of Europe. It is also found in the Persian Gulf, the Indian and Pacific Oceans, about the Cape, and elsewhere. It feeds on small fish, and seems to lie in the mud and sand at the bottom.

It was little to be expected, *à priori*, that the electric ether, which, however universally spread, in general is found condensed only by nature in the clouds of the higher regions of the atmosphere, should be capable of an artificial condensation, and should, by artificial means, be bottled, as it were, in the Leyden phial; but still less was it to be expected, that any animal should possess the faculty of condensing this terrific and all-powerful fluid, and of benumbing and suspending all the energies of its prey, by the sudden transmission of this subtle matter,—of overpowering its victims, and repelling or paralysing its enemies, by a flash of lightning sufficient in strength to subdue, but not to destroy. The identity of the magic power of the torpedo with electricity is, however, sufficiently established, not only by the nature of the effects produced by it on the animal subjected to its influence, but also by the fact, that these effects are to be avoided, and are to be avoided only, by means of a non-conducting medium.

It appears, indeed, that the organ by which the torpedo produces this condensation of the electric fluid, is more analogous to the galvanic battery than to the Leyden jar; but, however this may be, the effect produced is an instantaneous and paralysing commotion in the hand which touches it, and in the animal, however powerful, which may attempt to destroy it; and thus does the torpedo neutralize the efforts of its prey and of its enemies.

Like the gymnotus already spoken of, when the torpedo is weakened, and near expiring, it ceases to communicate the electric shock; it often happens, indeed, that it gives no signs of its invisible faculty, although in the enjoyment of all its strength. It will sometimes allow itself to be touched with impunity, and even then it appears that the non-employment of its powers is a voluntary act, inasmuch as the irritation of repeated touches will be sure at last to rouse the animal, and its electric strokes are then observed to be much more violent and painful than those produced in the more ordinary manner by a simple contact without irritation.

Reaumur confined a duck in a vase partly filled with water, in which was a live torpedo, and in a few hours the duck was killed by the repeated strokes of its enemy.

Our countryman Walsh was the first to draw considerable attention to this interesting subject, in the Philosophical Transactions of 1773 and 1774. He made various experiments on these fish at Rochelle, before it was even publicly known that they visited our own coast; and the celebrated John Hunter investigated the anatomy of it about the same period. Mr. Walsh was never able however to detect any spark on the giving out of the fluid by the animal; but the celebrated Galvani, in 1797, by means of the microscope, was more successful: so that if farther proof were wanting of the identity of this fluid with the ordinary matter of electricity, it was then obtained.

Having extracted largely from Humboldt on the electric apparatus of the gymnotus, we shall here, for the sake of parallel, give the substance of the celebrated John Hunter's observations on the apparatus of the torpedo.

Mr. Hunter informs us, that the electric organs are placed on each side of the cranium and gills, reaching from thence to the semicircular cartilages of each great fin, and extending longitudinally from the anterior extremity of the animal to the transverse cartilage which divides the thorax from the abdomen, and between these limits they occupy the whole space between the skin of the upper and lower surfaces. They are thickest at the edges, near the centre of the fish, and become gradually thinner toward the extremities. Each organ is attached to the surrounding parts by a close cellular membrane, and also by short and strong tendinous fibres, which pass directly across from its outer edge to the semicircular cartilages.

They are covered above and below by the common skin of the animal, under which there is a thin *fascia* spread over the whole organ. This is composed of fibres running in the direction of the body of the animal: these fibres appear to be perforated in innumerable places, which gives the fascia the appearance of being fasciculated; its edges all round are closely connected to the skin, and at last appear to be lost, or to degenerate into the common cellular membrane of the skin.

Immediately under this is another membrane, exactly of the same kind, the fibres of which in some measure decussate those of the former, passing from the middle line of the body outward and backward. This inner fascia appears to be continued into the electric organ by so many processes, and thereby makes the membranous sides or sheaths of the columns, presently to be described.

Each organ consists wholly of perpendicular columns, reaching from the upper to the under surface of the body, and varying in their lengths according to the thickness of the parts of the body where they are placed. The figures of these columns are very irregular, varying according to situation and other circumstances. The greatest number of them are either irregular hexagons or pentagons; but from the irregularity of some of them, it happens, that a pretty regular quadrangular column is sometimes formed. Their coats are very thin, and seem transparent, closely connected with each other, and having a kind of loose network of tendinous fibres passing transversely and obliquely between the columns, and uniting them more firmly together. These are mostly observable where the large trunk of the nerves pass. The columns are also attached by strong inelastic fibres passing directly from one to the other.

The number of columns in the electric organ of different torpedos varies according to the size of the fish. In a very large one 1182 were reckoned, but in a fish about a foot and a half long, there appear to be about 470 in each organ. New ones appear to be formed on the exterior edges, as the animal increases in growth. Each column is divided by horizontal partitions, placed over each other, at very small distances, and forming numerous interstices, which appear to contain a fluid. These partitions consist of a very thin transparent membrane. Their edges appear to be attached to one another, and the whole is attached by means of a fine cellular membrane to the inside of the columns.

The number of partitions contained in a column of an inch in length appeared, upon a careful examination, to be 150; and this number in a given length of column appears to be common to all sizes, in the same state of humidity, for by drying they may be greatly altered; whence it appears probable, that the increase in the length of a column during the growth of the animal does not enlarge the distance between each partition, but that new partitions are formed, and added to the extremity of each column.

The partitions are very vascular; the arteries are branches from the veins[1] of the gills, which convey the blood that has received the influence of respiration. They pass along with the nerves to the electric organ, and enter with them, then they ramify in every direction into innumerable small branches upon the sides of the columns, sending in from the circumference all around, upon each partition, small arteries, which ramify and anastomose upon it, and passing also from one partition to another, anastomose with the vessels of the adjacent partitions.

The veins of the electric organ pass out close to the nerves, and run between the gills to the auricle of the heart.

The nerves inserted into each electric organ arise by three very large trunks from the lateral and posterior part of the brain. The first of these in its passing outwards turns round a cartilage of the cranium, and sends a few branches to the first gill, and to the anterior part of the head, and then passes into the organ towards its anterior extremity. The second trunk enters the gills between the first and second openings, and after furnishing it with small branches, passes into the organ near its middle. The third trunk, after leaving the skull, divides itself into two branches, which pass to the electric organ through the gills, giving small branches to the gill itself. These nerves having entered the organs, ramify in every direction between the columns, and send in small branches upon each partition where they are lost.

The magnitude and the number of the nerves, bestowed on these organs in proportion to their size, are very extraordinary. Nerves are given to parts, either for sensation or action. Now, if we except the more important senses of seeing, hearing, smelling, and tasting, which do not belong to the electric organs, there is no part, even of the most perfect animal, which, in proportion to its size, is so liberally supplied with nerves; nor do these nerves seem necessary for any sensation which can be supposed to belong to the electric organs; and with respect to action, there is no part of any animal, however strong and constant its natural actions may be, which has so great a proportion of nerves.

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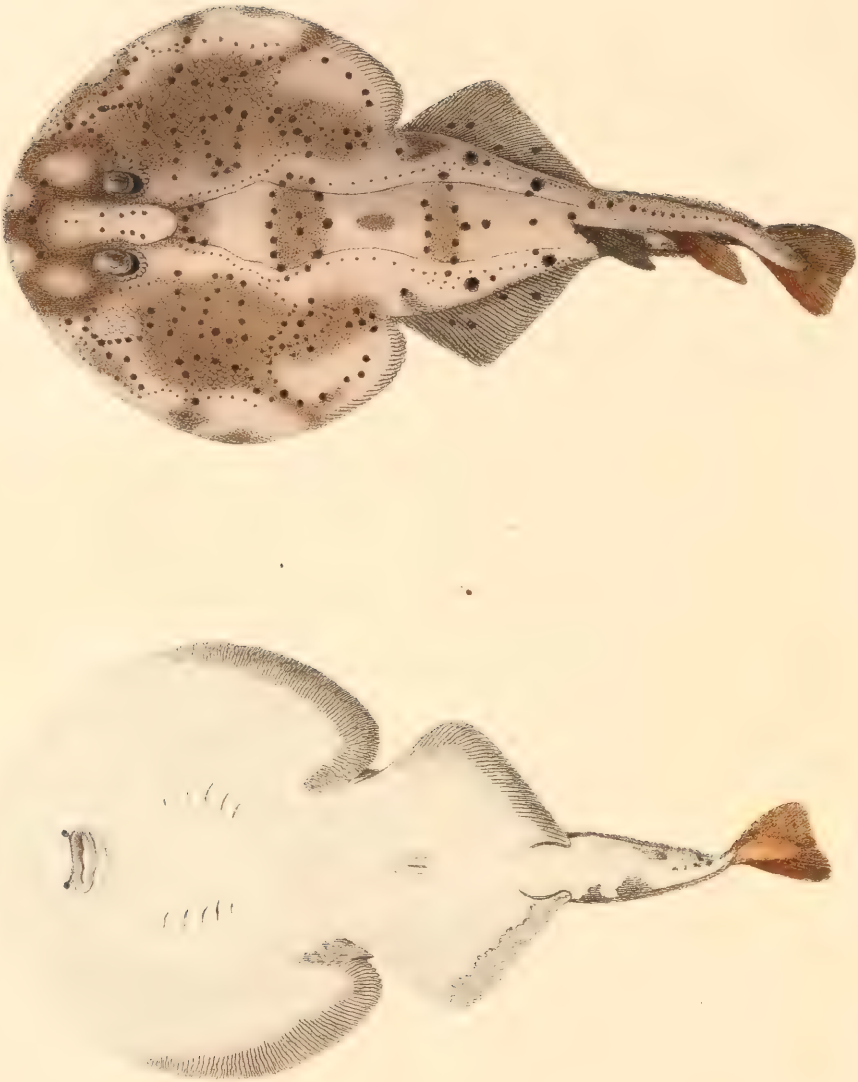
[1] It may be proper to remind our readers that the veins of the gills, like the pulmonary veins in terrestrial vertebrata, differ from all the other veins in the body, by carrying pure *arterial* blood.

If it be then probable, that these nerves are not necessary for the purposes of sensation or action, may we not conclude that they are subservient to the formation, collection, or management, of the electric fluid, especially as it appears evident from Mr. Walsh's experiments, and otherwise, that the will of the animal does absolutely control the electric powers of its body, which must depend on the energy of the nerves.

Independently of the fact of the electric shock being only to be communicated during the life of the animal, Mr. Walsh states expressly, that each effort of the animal to give the shock is accompanied with a depression of his eyes, by which also even his attempts to give it to nonconductors can be observed, the animal at the same time being, with respect to the rest of his body, in a great degree motionless, though not wholly so, from which we may farther infer, that the shock, when given, is matter of volition in the animal, a volition to which the multitude of nerves in the electric organs is in all probability subservient.

The *Torpedo immaculata* has the body yellowish above, with whitish starred dots, and a central spot of bright blue, surrounded with a circle of gray. The fore part of the head is emarginated. The eyes are reddish, and the tail long and slender. The electric organs in this species are scarcely visible, and the animal is capable of giving only very slight shocks. The flesh of this species is whiter and much more agreeable as food, than that of the other. It inhabits the flat shores of Nice.



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Torpedo Bancroftii

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We are enabled, through the kindness of Dr. Bancroft, to insert a figure of a torpedo from his drawing, which is new.

The colour is brown, with darker nebulose patches, and a number of black dots, the belly is white, but the edges of the fin brownish.

There are many species of the Ray, among which the most common are the three indicated in the text. viz. The *Thornback*, the *Skate*, and the *Rough Ray*.

The first of these *Raia clavata* is well known. The skin is shagreened, freckled above, but white underneath. A row of strong recurved spines passes down the middle line of the back, and there are three similar rows on the tail, besides various smaller spines. The young are called maids or maiden skate, and are generally spotted with white. The ordinary length of this fish is about three feet, but they are said to occur twelve feet long and more. The larger spines seem to vary in number according to the age and sex of the individual; they are attached each to a separate compact, hard, white, and smooth cartilage, buried for the most part under the skin.

The pectoral fins called wings have a much more considerable surface than the body itself of the fish, and are supported by a great number of articulated cartilaginous rays or bones, so to speak. These as in the Torpedo give the fish more or less of a rhomboidal figure, though the body itself differs little from the ordinary shape of other fish. No part however of the lateral space is occupied by any electric organ, as is the case with the torpedos. When the ray moves, these fins strike the water vertically up and down. The powerful muscles destined to move these immense fins form two thick fleshy beds, one above and the other below each fin, and these are divided into as many fasciæ as there are rays in each fin.

As the skeleton of this and all others of the genus is entirely cartilaginous, it is presumed the animals will continue to grow during the whole period of their lives.

This species is found in all the European seas, but especially in the North Sea. Like the other rays, it is very voracious, feeding on small fish and crustaceous animals.

The *R. batis* of Linnæus, is found in almost all seas, but seems to change places with the seasons. These appear to be the most numerous of all the large fishes, owing perhaps to the difficulty other large predaceous fish find in taking so wide a mouthful, and to the spines with which their bodies are armed. In accordance with the conjecture that cartilaginous fish continue to grow so long as they live, individuals are occasionally taken of enormous dimensions. They have been taken off our own coast of 200 weight, but in the West Indies one was caught measuring thirteen feet in breadth, and twenty-five in length. The tail, however, contributed largely to those prodigious dimensions, as it was fifteen feet long. That monsters of this size are not more commonly found, is not perhaps so surprising, when we consider that the smallest only approach the shore, and that the larger individuals continue at all times prowling at the bottom of the unfathomable depths of the ocean, where they may continue to live and grow for a period quite unknown to us.

They generally frequent those parts of the sea where the bottom is muddy, feeding on every animal to be found, either buried in the mud, or moving near its surface.

Generation in the Rays is effected by actual copulation, and the male is provided with two appendices, by means of which he holds himself in contact with the female. They are ovoviviparous, but their eggs are very curious, and to be compared only to those of the sharks; they resemble the husk, or shell of certain vegetable seeds, as the pea, are composed of two solid semitransparent tough square membranes, terminated at each angle by a short appendix, but without the curling filaments proceeding from these appendices, which are common in the eggs of the sharks; the shape, moreover, of these is nearer to a true square than that of the sharks' eggs, by which the two which are equally common on all parts of our coast, and are vulgarly called sailors' purses, may be easily distinguished. The ovary of the female has not a large number of these eggs; after one or two of these eggs have been fecundated, the fœtus continues to enlarge, until in due time it is enabled to escape from the shell or husk which contains it in the matrix of the mother, and then escapes from its parent in a perfect state, the shell or purse being expelled immediately after; a fresh fecundation then becomes necessary before any of the remaining eggs are perfected, and a fresh parturition is supposed to take place about once a month during the summer.

Of the *Trygons*, or Rays with the tail armed, there are several species, among which the *Common Trygon*, or sting-ray, (*Raia pastinaca* of Lin.) is the best known. This Ray is roundish, or rather pear-shaped, with the muzzle nevertheless slightly pointed. It is of a dirty yellow colour above, white underneath, and does not generally exceed ten or fifteen pounds in weight. It is found in considerable numbers in the European Atlantic Seas, and generally wallowing in the sand or mud, especially in the Mediterranean. Captain Cock moreover found it off the extensive coast of New Holland, and named one of the bays of that immense island Sting Ray Bay, from the number of these fish found there. The serrated sting on the tail it possesses in common with the *Myliobates* or *sea eagles*, in this respect therefore we shall speak of the two together.

Among the species proper to this subgenus, stands the *Raia aquila* of Linnæus as type. This subgenus is primarily distinguishable from the last, by having the head partly disengaged from the pectoral fin, and by the character of the teeth. The body is smooth, and the pectoral fins represent the expanded wings of a bird, whence its name is taken. It is deep brown above, rather lighter on the edges, the belly grayish white.

This fish is sometimes found weighing 800 pounds, and is therefore among the most formidable of these fish. It has been most commonly observed in the Mediterranean sea, though by no means confined to it.

The flesh of this ray, and its congeners, is very coarse food, but the liver is much prized as an eatable, and supplies a considerable quantity of oil. The sting on the tail of this animal, and its congeners, is an extremely formidable weapon. It appears like the horns of the stag to be deciduous annually, and to be replaced by a successor.

A third subgenus of rays with a barb to the tail, is that of *Cephalopterus* which also includes many species, but this has the very extraordinary addition of two extensions of the pectoral fin, one on each side of the head, forming horn-like processes or appendages, which seem to serve the animal in swimming. These animals are inhabitants of deep waters. There are several species.

Risso has described the *Cephalopterus Massena,* which has the edge of the fin bent down, and the top of the horn-like appendices black, while at the base, they are bluish without, and silvery within. The tail is furnished with three ranges of asperities, the body is black, brown above, silvery on the sides, and white underneath. Risso's specimen was twelve feet long, and twenty-seven in circumference. It was taken in the Mediterranean with its mate. The female, which was caught first, weighed 1250 pounds, the male scarcely 800. The former was alive when got into the boat, and made a very melancholy noise in consequence of the end of the tail having been inserted into the gills. The male specimen was seen constantly about the boat for three days after its mate was taken, and was subsequently found dead.

The *Cephalopterus Banksianus, Raja Banksiana*, Lacépède, is known by a drawing of the species sent to Sir Joseph Banks. The eyes of this species are on the upper surface of the head, and not on the sides as in the other; behind them are three long patches, three others like them near the origin of the tail, and two at the base of each pectoral fin, and there is a long filament at the top of each of the horn-like appendices of the head.

The dimensions of this species do not appear, but it is said that seven pair of oxen were required to draw it ashore.

The *Ceph. manatia, Raja manatia*, Lac. is another gigantic species. It has no dorsal fin, but there is a hump on the back, the eyes are lateral, there is an air valve behind each eye. The tail terminates in a forked fin. The back is blackish, and the under parts white.

This species inhabits the intertropical seas of America: a specimen or figure of it, which was sent to Lacépède, was, or represented to be, nearly twenty feet in length.

It seems that it is to this species we may refer what Barrère and other travellers have said of the enormous rays of the American and equinoctial seas, which spring above the surface of the water and splash it to an immense distance on falling into it. Levaillant, in his Second Voyage to Africa, speaks of having seen one the smallest of three which swam round about the vessel, about twenty-five feet long, and more than thirty wide, and Sonnini speaks of one which appeared to him larger and wider than the ship in which he was sailing.

The sting, as it is commonly called, with which the tail of these formidable fish is armed, inflicts a very dangerous wound, though by no means so deadly as is represented by the ancient naturalists with regard to the species found in the Mediterranean, especially the *Raia aquila* of Linnæus. This sting or barb, as we have said above, is deciduous, but its size seems dependent on that of the individual. It is rather flatted, and serrated on each side with barbs and hooks recurved towards the base of the weapon. This tremendous weapon the animal seems capable of striking with the swiftness of an arrow into its prey or its enemy, whose destruction and capture is further insured by the folds of the flagelliform tail, which are immediately twisted round it. It may easily be conceived, that a wound from this animal, inflicted even on a man, must be extremely dangerous from the serrated or jagged nature of the instrument, and from the additional lacerations which must necessarily attend the extracting it; but this, though bad enough, is the extent of the evil; there is no injection of poison, or any deleterious liquid, and nothing therefore is to be apprehended beyond the inflammatory consequences which may naturally attend so rough a laceration, especially in an unhealthy subject.

Colonel Hamilton Smith once witnessed the destruction of a soldier by one of these cephalopteri off Trinidad. It was supposed that the soldier, being a good swimmer, was attempting to desert from the ship, which lay at anchor in the entrance of the Bocca del Toro. The circumstance occurred soon after day-light, and the man, being alarmed by the call of a sailor in the main-cross trees, endeavoured to return to the vessel, but the monster threw one of his fins over him, and carried him down. The colonel is positive as to this fish being a cephalopterus.

The second family of the chondropterygian fish with fixed gills, the Sucking-fish or Lampreys, are primarily remarkable for the disposition of the genera, if the term may be used, to depart from the ordinary types of their class, and approach that of the worms.

At the first sight, these fish resemble eels in the elongated and rounded shape of the body, which, however, appears almost truncated at the head, in consequence of the singular conformation of the mouth. They are in general very lively, and exude a considerable viscosity from all parts of their body. Most of this family inhabit the sea and the larger lakes, but these ascend the rivers in the breeding season.

All the species of this family want a swimming bladder, consequently they all fall to the bottom of the water as soon as they cease to move in it; but as a compensation for this, they have various means in most of the genera of fixing themselves, so as not to be driven along by the current. Thus the *lampreys* attach themselves on solid bodies at the bottom of the water, by means of a sucker formed by the mouth, the *Myxine*, by means of a moveable crook on the upper lip, fasten on fish and suck their blood, but the *Amocœtes* which in structure come nearer to the worms, cannot even do this, and avoid their enemies only by suddenly burying themselves under the sand or mud.

All the Sucking-fishes feed on animal matter, either living or dead. Many of them are blind.

So much do these animals deviate from the ordinary characters of fish, that some naturalists have even hesitated whether to associate them with this class, or to refer them to the worms. Instead of a true vertebral column, they have a cartilaginous trunk, of a single piece, which is observed to soften at certain periods of the year. They have no articulated members. Many of them, always blind, attach themselves like leeches to fish, to suck their fluids. None of them possess horizontal moveable jaws. All have the intestinal canal simple, and often without a mesentery. Their respiration is effected by a single orifice. The ovary of the female is situated in the same cavity as the intestines, united in a single bunch, and the eggs do not pass through any oviduct.

The instruments of prehension and mastication in the first two genera are moreover very like those of several annelida, especially the leeches; while the absolute want of teeth in the last division, ammocœtes, is analogous to the case of the earth-worms, the arenicolæ, serpulæ, and terebella. There is also a considerable analogy between the conical muscular mouth, furnished with calcareous pieces, often serrated, moving transversely in nereides, aphrodites, and the lampreys. And the two transverse pectinated trenchant ranges of the mouth of amphitrites assimilate that organ in these animals to the mouth of the myxine.

The circulating system of the suctorii is like that of fish, with this difference, indeed, that all their vessels are attached to the parenchyma of the different organs, into whose substance they proceed in the way these vessels do in the dura mater, the bones and the liver of the true vertebrata. A similar disposition of these vessels occurs in the leeches and earth-worms.

The respiratory organs in the lampreys and ammocœtes are altogether different from that of most other fish, except the sharks and rays. These organs are like those of animals whose lungs are expanded laterally. In these, the cartilaginous parietes of the thorax act as springs, tending constantly outward, and consequently giving more space to the cavity of the thorax, while at the same time their flexibility permits a certain contraction. The power which the present animals possess moreover of taking in and expelling the water by the exterior orifices of the gills, presents a peculiarity differing altogether from what takes place in the respiration of fish in general; but in the annelida, we find a similar phenomenon.

The organs of generation in the annelida are very like those of these fish. In the earth-worm, for example, the eggs fall into the cavity of the belly, without the intervention of any oviduct; and they escape from the cloaca by small openings for the purpose, as in the arenicolæ and aphroditæ

The same takes place with the lampreys and ammocœtes. When the eggs are about to be protruded, they are detached from the bunch already spoken of, and fall in all probability into the cavity of the peritoneum, which communicates with the cloaca by two orifices, situate on the edge of the rectum, nearly as in the rays. It is observable, that the ovary terminates at a certain distance from the anus, and that it is sufficiently fixed, so as not to approach the conduits which make a communication between the cavity of the peritoneum and the water in which the animal lives.

The first genus, PETROMYZON, distinguished from myxine by the situation and number of the gill orifices, contains the *P. marinus*, *Great or Sea lamprey*, an inhabitant of the sea, and occasional visitant, in the breeding season, of rivers and streams. It attaches itself, by means of its sucker mouth, with great force to rocks and stones, from whence its name lamprey, (a lambendo petris) which the rage for nomenclature must needlessly alter to *Cyclostoma*, implying the circular form of its mouth. This mouth, singular in its construction, is armed with regular rows of conical bent teeth, set round a common centre, the largest of them being nearest to the throat. These teeth are covered with a solid horny matter, of an orange colour, which is detachable by maceration and ebullition. Our figure of this curious mouth will convey a better idea of it than a laboured verbal description; but it is necessary to add that the opening of the throat is in the centre of the large disk of the mouth, and the membrane which forms there the commencement of the œsophagus is soft and mucous. In the lower part, where the tongue is usually situated, there is a mass of teeth of the same colour as the outer rows, but supported by moveable cartilages acting like hyoid bones; the whole has some similarity to the top of the larynx in man. Although these little teeth are numerous, they are connected only to three principal pieces, of which they make a part. One of them, the nearest to the mouth, is odd, it has twelve regular teeth, six on each side, bent and set back to back, so that the angle of their junction is directed posteriorly toward the orifice of the œsophagus, and between two symmetrical pieces which bend into an elongated C.

This fish has two distinct dorsal fins, of a pale orange colour. The skin is elevated above and below the tail into a longitudinal crest, sustained by soft fibres, scarcely perceptible. The head is elongated, and has upon its top a small transparent white spot. Round the eyes are several small pores, from which a viscous secretion flows. The back is brown, or yellowish green, marbled brown, the belly silvery white.

The great lamprey, usually found about three feet in length, sometimes attains nearly six. It feeds on animal matter, either living prey, as small fish, or worms or dead bodies. Destitute of offensive arms, the lamprey nevertheless sometimes escapes its enemies by means of the suppleness of its skin, varnished as it were with a viscous humour. Its retreat also among the stones and weeds at the bottom of the water, among which it possesses a particular facility in insinuating itself, often secures it from the pursuit of its voracious enemies. In swimming, it imitates the motion of the snake.

Lampreys are found in all parts of the sea, but more in the north than the south. They are found toward the western, but not at the eastern end of the Mediterranean. At the beginning of spring, the signal for reproduction given by nature to all beings, induces them to abandon their usual etreats in the rocks at the bottom of the sea, and to ascend the fresh waters and there deposit their eggs. Their exact mode of fecundation and reproduction has not been observed.

The lamprey is much esteemed for the table in many parts of Europe, especially in Italy, and the story of the death of our first Henry, which is imputed to over-eating, either of this species, or the *fluvialis*, will occur to every one. There is a fashion even in epicurism, and at present a taste for lampreys seems quite out, or at least to be confined to the vulgar appetite.

The River Lamprey *P. fluvialis*, L. has the second dorsal fin angular, and united to that of the tail. The disk, or rather the circumference of the mouth, is furnished with a single row of very small teeth; in the interior of the mouth is another row of six very small teeth, and on each side are three emarginated teeth. Near the entrance of the mouth, in front, is a thick crescented bone, and behind it an elongated bone, placed crosswise, and furnished with seven small points; farther off is a second bone cut also into seven points, and finally, at a greater depth is a tooth or cartilaginous piece.

This fish, which seldom exceeds eighteen inches in length, has the head greenish, the fins violet colour, the back blackish, and the sides approaching to straw colour; the belly is silvery, and there are small transverse undulated stripes on the back; there is also a whitish or reddish patch near the neck.

It passes the greater part of the year, and especially the winter, at the bottom of the deepest rivers, lakes and ponds, but in spring, like its congener of the sea, it proceeds up the streams, &c. to deposit its spawn, and it is at this season that they are most commonly caught, and appear in our markets, exposed to the wondering gaze of the multitude under the strange name of nine eyes, the more strange when we consider that the circular branchial openings called eyes, are but seven on each side.

Of the subdivision HEPTATREMUS, which contains at present but a single species, *Petromyzon cirrhatus*, Forst. *Gastrobranche dombey*, Lac. we shall merely observe, in addition to the generic character of myxine, stated in the text, that Sir Everard Home, in the Transactions of the Royal Society for 1815, has published an interesting description of the organs of respiration of this animal, from a specimen in Sir Joseph Banks's collection; that these organs resemble those of the lamprey as to the number of branchial openings, seven, but they approximate in other respects to the corresponding organs of myxine.

The *Gastrobranchus cæcus*, Bl. The *glutinous hag* does not exceed a foot in length, the back is blue, the sides reddish, and the belly white. Its soft and extensible lips enable it to fix itself to bodies, and are so disposed that the circular mouth represents a sort of cupping glass, so much the more certain in its operation of adhesion, as it has a hook to the upper lip. The body has on each side a row of small openings, from which the mucus spoken of in the text as peculiar to the genus is exuded.

This fish lives principally in the north of the European sea as far as Greenland. It is quite blind, and generally lies concealed in the mud and sand. It often seizes on the softest parts of the large fish, and fixing itself there, lives by sucking their juices like the leech, and it is said that they will sometimes introduce themselves into the viscera like the intestinal worms, but this is not verified, nor is it probable; the similarity of this fish, in common with the other Suctorii, to the worms, in all probability induced the statement.

Of the last subdivision of these curious fish, enough on the peculiarities of structure may have been said in the text, we shall only add, therefore, that they are very active by means of their singular mouths in digging into the mud to hide themselves there for days together; when not able to do this, they fall to the bottom, and in general soon become the prey of pike, perch, &c. Most of them are destitute of eyes, or have those organs in a merely rudimentary state covered by the skin. Their decided departure from the class of fish, and approximation to that of the red blooded worms, has been already alluded to in the text.

Ammocœtes branchialis has very small or rudimentary eyes, covered with a membrane; the dorsal fin is very low and terminates in a bent line, the back is greenish, the sides are yellow, and the belly is white. The usual length is about seven inches. They subsist on worms, insects, and carrion. Linnæus named them *branchialis*, from the notion of their attaching themselves to the gills of fishes, but this is not verified by observation. They are eaten by those who can overcome their repugnance to the worm-like appearance of these fish, an appearance evidently by no means merely ideal.

The *red Ammocœtes* has very small eyes, and the tail fin sublanceolate. It is of a blood-red colour, deeper on the back than the sides, and thereby still more assimilated to the worms. It is found in the Seine, in Normandy.

We shall conclude our Supplement on Fish, with some observations[1] on the importance to mankind of this class of animals, viewed as articles of nutriment and commerce.

When we contemplate the vast number of genera and species of fish already known, and reflect that in all probability numerous additions will continue to be made to the catalogue for a considerable time to come; that an immense number of species exist through the mighty expanse of waters, in rivers, lakes, seas, and oceans; we are naturally led to inquire, to what end these congregations, these shoals of beings, teeming with life and resplendent in beauty, are thus cast abroad; for what purpose they have received, above all created animals, powers of reproduction great beyond calculation; of individual growth surprisingly rapid, and in many species of long continuance; while at the same time their duration of life is no less protracted? Surely, that they might fill space, by peopling a particular element, or multiply and subsist by mutual destruction, cannot be the only objects of their existence. As a class, fish most undoubtedly answer purposes we may never fully comprehend; one of them, however, we can assume, namely, that they should be in their proportion subservient to the wants of man.

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[1] By Colonel Hamilton Smith.

Independently of the concession we have upon sacred authority, man in the rudest state of savage life is forcibly impelled to assuage hunger by means of aquatic animals. Molluscous and crustaceous genera adhere to rocks, repose upon the sands, traverse the flats exposed by the receding of the tides; small fry play in the remaining pools; beings of various classes cluster among the seaweed; and all tempt the savage in want of food to avail himself first of what is obvious on the dry spaces, next to wade, and soon to swim and dive after his prey; few or no aids are required from mechanical skill, nor are exertions of sagacity or experience necessary to enable him to dig out of the sand, to scoop, to noose, or strike his victims. As the primitive savage may have done, the New Hollander still dives for fish; the Malay wades after them; the rudest men know that they can be intoxicated with herbs, intrapt in weirs, intercepted at shallows, and speared in many ways. The temptations to trust to the produce of the waters for subsistence, held out at first by the facility of success, were moreover among the most direct of the remote causes which led to civilization: for though the advantage of swimming in the pursuit of fish, was only a first step, which gradually caused man to improve upon his means by substituting a log, then a catamaran, a brace of hollow gourds, a balsa, a goma of bulrushes, a killuch of reeds, a carab, corrach, cw-c or bubast of hide, a canoe or cymba, phasellus, baris, arca, cibotus; till by degrees the læstres, gaulos, liburniæ, &c. led to the most improved ships, and by their means, navigation, and commerce, and all the sciences and arts of social life were established[1]. But the progress of such improvement must have been very gradual, and in many places, where counteracting causes operate, none ever took place. There are in the latitudes of extreme heat and cold, regions which, but for the presence of fish, would be uninhabitable for man, and in them he has never emerged from the condition of a savage, or relapsed into it, when brought from more civilized regions and compelled to reside there. On the sterile, snow clad cliffs of Nova Zembla; on all the northern coast of Asia and America; on Terra del Fuego in the south; on the Maldives, and the shores of Australia, the Mekrem and Suahkim sands of the tropics, the wretched inhabitants are almost restricted to an ichthyophagous life, and in some places even that pittance is precarious. Hence the ancient Indian and Gedrosian fish-eaters confined their industry solely to a mode of preservation of fish, which may have been like that of the present suahs on the Red Sea, who prepare them in the form of balls, and dry them in the sun.

Unconscious of the vast benefit the world was to derive from navigation and commerce, it was probably, as Cuvier justly observes, with a view to humanize the people, that the Egyptian sacred legislature aimed at inspiring them with a horror of the sea, and proscribed the use of fish, while the greatest attention to agriculture was enjoined: for the priesthood, in order to enforce their doctrines by example, continued to abstain from that kind of food, long after they had conceded it to the other castes, who could not be prevented from the use of an aliment which a great river, and numerous canals and lakes offered in abundance.

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[1] The log and peg is still used by the Coranas of South Africa, the catamaran in Peru and in India, the hollow gourds on lake Chad in Africa; the balsa of seal skins on the coast of Chili; the goma or baris of bulrushes anciently, as now, on the Nile; the killuch of reeds on the Persian rivers; the carab, corrach, cw-c or bubast, basket boats covered with hides, by the Persian and central Asiatic nations, the Celtæ and others: all the others are different names of ancient canoes, till they become more complex in structure, as the Celtic læstri, Phœnician gaulos, and the ancient piratical liburniæ were.

It appears that before the religious institutions of Egypt were in force, fish was eaten raw by the lowest castes, and the practice survived the prohibition; salted and sun-dried fish being in use even now, in the upper country. The population could not indeed have attained the density ascribed to it by the ancients, even if we allow for considerable exaggeration, without the use of fish to a great extent; and although the waters of Lake Mœris may not have been able to nourish the enormous supply calculated by Lacépède [1], still the Nile and subordinate waters furnished so great a proportion of food, as no doubt contributed materially to the early knowledge of different species. The mythological doctrines in vogue during the most ancient periods of social institution having adopted a symbolical mode of recording tenets which had reference to the diluvian catastrophe, very generally typified the patriarchs and the ark by emblems, where the fish was always conspicuous. Dagon, Notuis the god-fish who saved Isis; Venus flying from Typhon in the form of a fish; Vish-nou (Sanscrit) fish pilot; Nataghi (Tatar) the swimmer; Canon of Japan, &c. all refer to diluvian mythi. Also when a particular species of fish more than any other was to represent the ark, bearing the seeds of future reproduction, ancient nations sought for such as would attest their prolific power by the quantity of roe they contained; thus in Egypt different Nomes had different types, and they even embalmed specimens of the sacred fish, some of which still remain in the collections of the curious. At Elephantine they honoured the meotis, at Latopolis the latos, at Syene the phagre or phagronius: the oxyrhinchus in the Nome and city of that name, beside the lepedotis and binny in other places[1]. The zeus seems to have been held in veneration by the Greeks; and the golden carps of Asia were particularly venerated, as the cyprinus orfus still is, at Orfah[2]. The Western Celtæ had legends of the Brithyll[3], sometimes designating the trout, at other times the mackarel, and the Morhuah (daughter of the sea) or modern codfish, which the Celto-Cymmerians also seem to have revered by the name of codsyn, as they did the conger, i. e. royal fish of Gothic dialects, in their Cyngyren.

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[1] Lacépède affirms that Lake Mœris alone might produce more than 18,000,000,000 fish, of more than two feet long each.

But the motives and the objects assigned to these strange deifications are, it is true, often contradictory and always vague, puerile, and of little moment in a zoological point of view; though, when they are coupled with the historical and legislative facts of abstinence from fish in some nations, and the exclusive use of some species in others, and indiscriminate consumption of all kinds in a third class, a more absolute knowledge of their different characters and properties must have been the result. Accordingly we find in the ancient sepulchral caves of Thebes, representations of fish drawn on the walls in outlines and colours, marking distinctly ten species, mostly of silures, mormyri, lates, and chromis[1]; other delineations occur of fish and fishing, (angling) among the oldest hieroglyphical remains, which show the law and the practice to have been at variance in a remote period. The same kind of institutions and the same violation of them, however differently related, evidently obtained in Palestine; for on that coast, abounding in fish, its use appears to have been prohibited to the indigenous population, until the nautical Phœnicians commenced their settlements upon the outer rocks which formed the nucleus of their subsequent commercial sea-ports on the Aramean shores. Then rose Sidon[2], the modern Said; so named from fish, and standing on the shores of a bay abounding to excess with finny produce to this hour. There the clans of piratical navigators, afterwards known as Pæni, settled, and with the aid of indigenous tribes, Arvatites, &c. commenced that career of industry which has stood prominent in the annals of mankind: they were the first who undertook fishing with commercial views in the Mediterranean. The Jews, and we may add all the Philistian,

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[1] It is impossible to comprehend the rationale of Egyptian veneration; the two last mentioned, for instance, were both revered and abhorred, because possibly the people took the mystical sense to be the same as the obvious import.

[2] Or Edessa; they are fed by pious musselmans in the pond of the mosque of Abraham, where it is probable they have continued to be revered from the period Atargatis had her temple here. The moslem legend of Abraham and the pool, is a counterpart to the avatara of Vishnu chatrum, of the same character.

[3] The Brithyll with the modern Welch may even be taken for the stickle-back, because all these fish are variegated; but when connected with the mythology of the Celtic nations, may it not derive from Brys, through Brythain, contention; or that being which strives against tumult, the tumult of the deluge? The learned Davies has overlooked the Brythill: the Belgæ venerated the sturgeon, the northern nations the bogmarus.

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[1] Cuv. Poiss, vol. i. p. 6. Caillaud voyage a Meroë; there are others in the antiquities of the great work on Egypt.

[2] *Sidon*, צידן, *Tsidhon*, Trogus translates a fish. *Said*, the present name, denotes a fishing place. Said-on and Dag-on both fish divinities, the first in the female form, the last the male seed bearer; not from Σετων because the roots are of Aramean origin, as the aratri et frumenti deus, is from a transition in the meaning. Sidon, the daughter of Canaan, is a figurative oriental form of expression.

Canaanitish and other shepherd tribes of Syria, were of themselves averse to maritime adventures. They had laws which originally forbad or restricted the use of fish. Moses prohibited the eating of all species without scales and without fins, which evidently referred to the siluri of the Nile and of the Lake of Tiberias, and was also applied, though incorrectly, to eels. As they were not a seafaring people, the Phœnicians supplied them with fish, in exchange for wheat, pannay, honey, oil and balm[1]. The denunciations of the Prophet, that nets would be spread at Tyre, show the abundance of fish on that part of the coast also; and the spreading of nets, that the demand for them was greater than a mere littoral population would require. It is true no mention is made in Ezekiel of the art of curing fish; but the commodities received in exchange, show that the markets in the interior, and of Jerusalem, were supplied from thence with that article, and the distance and climate are sufficient proofs of the necessity of some artificial preparation to retain it fit for sale. A people whose attention was wholly directed to marine affairs, and whose original prosperity was derived from the abundance and excellent quality of the fish on their coast[2], could not remain long ignorant of the arts necessary to make their gains greater and more certain, and it is likely that they extended their fisheries, as their commercial spirit was increased by success. If the Phœnicians did not form the fisheries in the western extremity of the Mediterranean, Carthage, a colony of theirs placed on a spot abounding in fish, either maintained those already established or begun their formation; such were Leptis Minor, Malaga, Portus Magonis, Carteia within the straits; Gades, Portus Hannibalis, and even Clunia on the Atlantic[3].

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[1] Leviticus xi. 9. Nehem. xiii. 16. Ezek. xxvii. 17.

See Clarke's travels.

[3] Leptes minor, said to be Leinta or Tripoli, paid a talent per day port duties to Carthage. Portus Magonis, Port Mahon; Carteia, Alge-

The Punic people were however not long the only fishing race, for the Greeks, as soon as their migratory convulsions had passed, laid the foundation of all we know respecting fish. It seems they also at first neglected or undervalued fishing before their civilization. Homer, Plato, and Athenæus, hint the existence of prejudices on that head, although the former was most certainly acquainted with the use of nets and the angler's rod[1]. Hesiod speaks of the casting net[2]: nor was it possible that such prejudices, if ever they did exist, should continue in a peninsular country, every where indented with sounds and creeks, and whose population, in a great measure insular, was from the commencement familiar with the sea. Fresh and salt fish soon became a prominent article of diet among the Greeks, their comic poets also constantly advert to it. Aristophanes notices fish more than twenty times, and Athenæus quotes perhaps two hundred passages from authors whose works are now lost, where fish are mentioned. The art of fishing became in this manner one of the most lucrative avocations: large establishments for the purpose of salting and curing fish, were made in favourable situations, which grew into flourishing cities. Byzantium and Synope were indebted to them for their celebrity, and the harbour of Byzantium, in particular, obtained the name of golden horn on account of the abundance of this produce. In the Euxine it appears that the Greeks as well as the Phœnicians had a fishery in the Heracleotic Chersonesus, probably at Balaclava. From these sources, private individuals soon rose to opulence,

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ziras? Portus Hannibalis, Lagos bay, Clunia, said to be Corunna. All these places abound in fish, though some of them may not have been actual fisheries for distant markets. Of Malaga it should be remarked, that according to Bochart, Malach in Hebrew and Phœnician denotes to salt. Balak is a general oriental name for fish, of which Halec is a mere mutation.

[1] Odyss. l. xxii. v. 324. and l. xii. v. 251.

[2] Hes. Scut. Herc. v. 212.

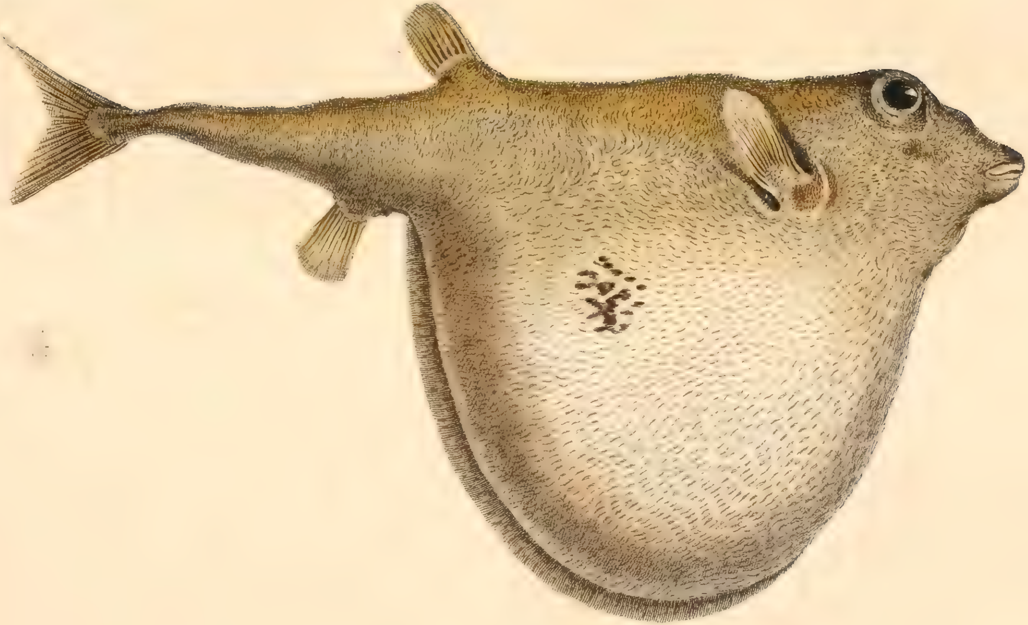
and the comic writers of antiquity frequently allude to a fish-salter named Cherephile, who became an Athenian citizen, and whose son spent in extravagance the property his father had accumulated. Several persons were lashed by the satirists merely because they were inordinately fond of fish: among these we find the names of poets, orators, and particularly the painter Androcides of Cyzicus, who executed with great care the portraits of the species found in the straits of Scylla, and became in this manner the precursor of the great iconographers of our times.

If a proof were wanted of the variety of species which the Greeks had learned to distinguish, we should find it in the fact that more than four hundred different names of fish exist in their language, which can be said of no other tongue. Buffon may justly ask, "such an abundance of names, such an exuberance of clear and definite expressions, do they not proclaim a corresponding multitude of ideas and observations? And may we not allow the inference, that a nation which had named so many objects more than ourselves, was also acquainted with so many more objects?" Many of these names remain however totally undetermined, and others are of doubtful application; and it is clear that numerous synonyms occur, created by the original difference in the language of Greece, and by the posterior importation of foreign names. Still the fact proves the justice of the remark, that Greece, and Athens were in particular, filled with piscatory citizens:

> "We know that town is but with fishers fraught,
> Where Theseus govern'd, and where Plato taught."
>
> *Sandys.*

The Greeks transmitted a great part of their nomenclature of fish to the Romans, and probably the principal directors of their fishing stations were Greeks, for as the Romans never patronized speculative science, and seldom condescended to mix themselves up with professions that did not imply a connection with government, commercial industry was left to Greeks, Gauls, and Africans. A few inscriptions and notices remain connected with the fisheries of the Romans, where Greek proper names predominate. At the time when the empire flourished, and the population of the civilized world was condensed around the shores of the Mediterranean, almost every bay, creek, and channel, had fishing stations, thousands of men were employed, and salt-fish was conveyed from distant ports on the ocean; nor were these measures sufficient. When fish had risen in estimation, and the luxury of the rich demanded expensive dishes, ponds for fresh water species, and river fish were despised. Lucullus cut through a mountain near Naples to introduce salt water into one of his preserves; Licinius Muræna, Philippus and Hortensius had similar stews near the shore. Some were of such magnitude that Hirrius could lend Cæsar two thousand murænæ at one time. Mullets, doradoes, sciænæ, turbots, soles, and a variety of shell fish, had all separate compartments in them. Immense sums were squandered in this pursuit, and great cruelty practised in feeding the fish. When the species caught on the Italian coast were insufficient to satisfy the pampered appetites of the great, an officer of rank correspondingto a modern admiral was employed with a fleet to stock the Etruscan sea with the scarus, brought for that purpose from the coasts of Greece, where it was then only found. We shall see in another place, with what excessive refinement of luxury, mullets were brought, by means of small pipes constructed for that purpose, from the preserve alive into the apartments of the *gourmands*, that they might enjoy the sight of them dying before they were dressed for the table, and the excessive prices that

Fish Pl. 10



Triodon bursarius

London, Published by [illegible]

were paid for one, provided it exceeded the others in size.

But if these absurdities were of no more advantage to the science of ichthyology than the later abstinence of flesh meat enjoined by Romish Christianity, the great and continued demand for fish certainly rendered the art of fishing, in all its circumstances, quite perfect, and navigation was so greatly improved, that, by this inducement alone, it may be said to have completed its conquest of the sea. The fisheries of the Mediterranean, encouraged through the religious opinions of the surrounding nations, retained the practices of the ancients, and were the instructors of the moderns on the Atlantic. They continued, as anciently, to confine their pursuit chiefly to the tunny and the mullet, and for this purpose they used the enormous nets called mandragius (from the Greek *μανδρα*), and were directed in the operation by a chief styled Rais (head), an oriental word, which may be as ancient as the Carthaginian era. But their stations, if not their system, has in many places greatly varied.

What the Spaniards of the coasts of the Mediterranean practised was also in vogue at an early period among the Biscayans, on the side of the Atlantic. In pursuing the whale, on board of their balænaras, through the stormy bay which bears their name, they became familiar with the coasts of France, and found, that from Corunna northwards, abundance of fish might be caught as far as the Pertuis Breton and Pertuis d'Antioche, near la Rochelle, fit for salting and general commercial purposes. By degrees they ventured farther, till they reached the entrance of the channel and the west coast of Ireland. So late as 1553, they paid one thousand pounds per annum to the Irish exchequer, for leave to fish during a term of twenty-one years on that coast[1]. It seems that the Scots had a traffic in herrings so early as the ninth century[1]. The Flemings also had from the year 1164 commenced regular fishing for the herring, which they sought not off their own coasts, but in the Baltic, near the Isle of Rugen, and Courland. About the year 1313, the fish having changed their haunts to the coast of Schonen, they were followed by the fishermen. In 1417, the first English vessels appeared in the Baltic, on the same pursuit; and it would seem from this circumstance, that the herring shoals had not yet come down to our coasts in the numbers they subsequently did, though they were certainly known and caught, as appears from the charter of lands held at Carleton, in Norfolk, dated in 1234, by the tenure of bringing to the King twenty-four pasties of herrings, on their first coming in. There existed also from the reign of King John, proper officers, with fixed regulations, to superintend the fishery on our eastern coast, already in the hands of the Hollanders, who obtained protection by proclamation, and no doubt upon payment of certain dues; and the herring-fair at Yarmouth, where the process of salting and curing was carried on for several centuries, was at that time, most likely, at least in part, in the hands of these sturemanni[2] and marineri, as they are termed in that document. About the middle of the fourteenth century, Will. Beukelm, a native of Biervliet, near Sluys, in Flanders, obtained celebrity for an improved method of sousing her-

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[1] "All manner of vessels of other lands coming in the sayd land of Irelond a-fishing, being of the burthen of xii ton, or less, and having one

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drover or boate, every of them to pay ——." Stat. Hibern. 5 Edw. 4. cap. 6. shows that more than one foreign nation frequented the Irish fishing-banks in the middle of the fifteenth century.

[1] In 836, the Netherlanders came to purchase salted fish. Anderson, Hist. of Commerce.

[2] Stureman, Dutch, pilot, or literally, steersman. Edward III. regulated the Yarmouth herring-fair by an act passed in the 31st of his reign. In 1358, fifty lasts of herrings were shipped at Portsmouth, for the use of his army in France. Herrings *in tuns* occur repeatedly in the account of provisions collected in fortresses during the civil wars of the Plantagenets.

rings, since known by his name, Beukelm, from which our word Pickle is derived.

Whether it arose from the frequent state of hostility between Spain and England, or accidentally, as it is asserted, in pursuing the lucrative trade of whale-fishing, does not appear, but the Biscayans claim the discovery of the banks of Newfoundland, a century before the voyage of Columbus. Their assertion, and that of the French in favour of Cartier, a native of St. Maloes, proves at least the importance attached to this discovery, on account of the cod-fish which frequent them, and shows that both the Biscayans and the French were the earliest adventurers who frequented that fishery. There is, however, a third nation, namely, the Portuguese, who certainly fished on the banks at an early period. The Norwegians, also, about the same time, or even before it, had turned their attention to the pursuit of gadoid fish, first along their own shores, and afterwards, with the progress of discovery, on the coasts of Iceland, and perhaps as far as Greenland; Hamburgh, together with other Hanseatic towns, were likewise forward in all the branches of commercial fishing within their reach. But the British Islands, peopled by a race of most daring seamen, and of the ablest merchants, by one of those unaccountable perversities incident to human concerns, were nevertheless destined to be among the last to appreciate the value of commercial fishery, and seem doomed never to be completely successful on their own coasts, in a pursuit, which by nature they ought to have cultivated paramount to every other. For round the shores of Great Britain and Ireland, in every direction, lie the richest and most ample fishing banks belonging to Europe, and amongst them some, which even at this moment are not appreciated, nor even completely surveyed.

With a spirit of industry deserving the highest commendation, the Dutch have practised for ages the art of fishing with whole fleets, mostly on our own coasts, and have derived incalculable wealth from the pursuit, under circumstances naturally more unfavourable to them, than to the inhabitants of Britain [1]. On the west coast of Ireland, the Biscayans in former times, and the French at present, obtain an ample reward for their exertions, while the same pursuit, under Irish management, offers a constant series of losses and misfortunes. There was then formerly, and there is still at present, some powerful, though latent cause, to produce these unlooked-for results. Although this work is not the proper vehicle for the discussion of a subject of political economy, still a few remarks will not be objectionable; because the many attempts to ameliorate the fishing establishments which have been fruitlessly made, deserve that inquiry, which a question, fraught with the prosperity of a large class of the community, the actual subsistence of the poor, and the best nursery for seamen, is justly entitled to.

Long before the union of the two crowns, endeavours had been made in both countries to improve this branch of national industry. Frequent laws enacted in the reigns of James III., IV., and V., show the attention of government in Scotland to this branch of industry; and the superior management in the business which the Dutch possessed, for against their engrossing the trade they are mostly directed. After the accession of the house of Stuart, legislative measures were adopted to establish fisheries in the islands of Scotland, but defeated by the ignorance of the people of

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[1] "The seven united provinces, which are all together not larger than Yorkshire, from their fisheries alone, for which they are not nearly so well situated as the Highlands and Isles of Scotland, supported a population equal to three times the number of inhabitants in the whole of North Britain." Mr. Fraser's Statement to the Speaker of the House of Commons. 1803. In their annals, herrings began to be regularly fished for in 1163.

Lewis. In the next reign, an association of the three kingdoms for a general fishing within the *hail* seas and coasts of the king's dominions was ruined by the civil wars. On the Restoration, a well-digested plan was formed, and the measures taken went on prosperously, till the sovereign withdrew his bounty, when that association likewise broke up. A few years after, (1667) another company was formed, and it was then found necessary to have busses built in Holland, and mostly manned with Dutch fishermen; but that country being then at war with France, almost all of them were captured, under the pretence that they belonged to the enemy, and the company was ruined. A farther attempt was made in the same reign, which the death of the king, and the succeeding troubles, also frustrated. Soon after the Revolution, the subject was resumed, but the influence of Dutch councils with King William, together with his continental wars, again frustrated its success. The Scottish Parliament also made, about this time, several enactments in favour of fisheries, but the Darien establishment supervening, diverted the attention of the public, and their measures proved of no avail.

At length the princes of the house of Hanover took up the question, and in 1749 a company with large capital was formed, and the newspapers undertook to show that it was easy to deprive the Dutch of their monopoly in the herring fishery. For the first time, the contest between the two nations assumed the form of honourable rivalry in the pursuits of industry. But the Dutch, in possession of the foreign markets, frugal in their habits, and thoroughly expert in the business, produced fish which had the reputation of being the best, and maintained their superiority, till the capital of the company gradually sinking, even when an additional bounty was granted by government, they finally obtained the contested monopoly.

In 1786, Mr. Dempster, then a member of the House of

Commons, again drew the attention of the public to the state of the British fisheries. A committee then formed came to a resolution, that the best mode of improving and extending this great source of national wealth, was to encourage the inhabitants living nearest the seat of them to become fishers; and it being found that the north-western coasts of the British Islands, though abounding with fish and with fine harbours, were destitute of towns, an act was passed for incorporating certain persons, by the style of the British Society for extending the fisheries, and improving the sea-coasts of Great Britain. The Isle of Mull, Loch Broom, the Isles of Sky and Cannay, were named to have towns built upon them, but no success deserving the name resulted from these measures.

The Rev. J. L. Buchanan, in his general view of the fishery of Great Britain, shows, with a thorough knowledge of his subject, that the want of a successful result, after so many endeavours, can be ascribed to known and not irremediable causes. After animadverting with some severity on what might have been termed the Dutch-Scotch fishery, which occasioned disputes little creditable to either party, he proceeds to show, that the stations marked out by the managers of the British Fishing Society were not the most eligible for the purpose intended; that the best practical fishers were not at these stations; that the fish was more abundant and of superior quality at other places; and that costly buildings for collectors, comptrollers, and even large public houses, might have been dispensed with, at least until the prosperity of the enterprise justified the expense. But the greatest evil arose from the government itself. While holding out bounties and drawbacks to encourage the fishery, a duty upon salt, and perplexing regulations respecting its foreign or home manufacture, the quantity allowed to be stored, and responsibility respecting the diminutions incident to it from liquefaction, obstructed the general prosperity, and thwarted in particular the poorer classes, to such a degree, that eighteen barrels of fresh herrings were given for one of salt, and in Skye heaps of fish were allowed to rot on the beach. The fluctuations which the population of the Isle of Man has suffered since 1765, when that island was annexed to the crown, are likewise entirely to be ascribed to the restriction and subsequent readmission of salt duty free, because upon the price of that article the success of their fishery must ultimately depend.

Fiscal regulations were likewise the bane of the fisheries in Scotland. Mr. Fraser, who greatly exerted himself in 1791 to ameliorate the system, declares, that the net produce annually accruing to the revenue from the duty on salt, levied in the six Highland counties where the trade was chiefly carried on, amounted, on an average of ten years, to not more than £172. 6*s.* ! ! Yet this occurred in a vicinity where at certain seasons fish, and in particular herrings, are so plentiful, that the fishermen often pick out of their nets only as many as they want for the use of their families, and throw the rest overboard; where the gannets alone are estimated to devour nearly one hundred millions in each season, and whales follow the shoals, and bite into their closely pressed banks so as to devour tons at a mouthful[1]. It is in this direction also, that the whole extent and outline of the soundings towards the north and west, which constitute in that direction the termination of the basis supporting the British Islands, have not been exactly determined.

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[1] Mr. Buchanan says in substance, that " this is the most proper time for harpooning the whale; for having driven the shoals in shore, so that they bank upon each other almost as close as if they were packed, the whole attention of the monster is directed to his prey, and his enormous strength is insufficient to force a passage among the herrings, who would impede his fins, and prevent his rising to breathe; he is then found in their rear, feeding like a horse at a hay-rick, each gap he makes at a mouthful being instantly replenished by the pressure of the mass of fish."

The north, west, and south coasts of Ireland, possessing admirable fishing ports and salmon streams, abounding with every description of excellent fish, appear to have suffered equal, if not greater mismanagement. Mr. Fraser, as zealous on this coast as he had been on the Scottish, made personal inspections of the Nymph bank, in June, 1802, and found abundance of fish of the best description for the markets. A fishery has accordingly been established on that coast, and pursued with various success: still the intention of supplying the London market with fresh fish does not appear to have been at all effected[1]. It is said, that the relaxation of religious opinions in the South of Europe has reduced the demand for salt and cured fish; but the decrease of the consumption is probably not considerable. Habit and climate are agents which counteract a change of manners; it may be said with more truth, that during the wars of the Revolution the Dutch lost the power of supplying the foreign markets, and with it the practice of extensive open sea fishing, which they have not since been able to recover.

Accordingly, the present times have been more favourable to British enterprize in that branch of trade, and the laws which so often are found to be opposed to industry have relaxed and modified much of what was injurious to the progress of the fisheries. Parliament, instructed by the exertions of the Downs Fishing Society, and the Fish Association, and receiving annual reports from the commissioners appointed to superintend the distribution of bounties, established 48 George III., continues the plan of a gradual improvement of the home fishery in particular, and the beneficial result of the measure in general is attested by a progressive increase of supply and demand. The markets in this kingdom have not, however, as yet obtained the complete attention of the legislature. Monopoly of fish, that old and stubborn abuse, though waning, is not destroyed, nor are the inland places, and indeed many parts of the coast, supplied to the extent the liberal hand of Nature affords for the use of the population of these realms.

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[1] Unfortunately, the life of privation inseparable from sea-faring and the practice of fishing, is, it would appear, not congenial to the Hibernian people, and the want of stimulus to continued industry besets all classes. Hence, though Lough Swilly, and many parts of the coast, swarm with herrings, the fish caught is managed with so little care, being generally cast into holes for salting, that no prime commodity ever can be derived from them; consequently, no increase of demand and of supply can arise on a coast where the population is so much in want of the means of subsistence. Ignorance also destroyed Mr. Whately's valuable invention of the trammel net, while idleness and prejudice preserved the beam-trail, which destroys infinitely more embryo fish than are caught by it. But it may be hoped, that, in this respect, better times are at hand.

On the banks of Newfoundland, notwithstanding that the sovereignty of the coast belongs to Great Britain, the natives of the United States, by means of some trifling indulgences on shore, and the French, with the help of two small islands, contrive to be formidable rivals to the British fishery, and lately, the Norwegians have shown no less skill and industry in the same pursuit. In the Indian seas, there have likewise existed commercial fisheries from the earliest periods; particularly on the coasts of Ceylon and Java; and the insular Malays may be considered as a piscatory people, following their profession on all the coasts of Southern India, their fleets making even an annual voyage to Australia for the sole purpose of fishing and curing in those seas fish and other marine molluscous animals, known by the name of biche de mer. But we have already trespassed too long upon the reader with considerations not strictly ichthyological; for even the appropriateness of an abstract of the fisheries of the ancients, and a view of the state of the trade, in the present work, may be called in question; and we shall therefore only add, that its importance in a national point of view may have betrayed us too far, and that we refer those who wish to examine the question more minutely, to an article under the head of fisheries, in the supplement of the Encyclopedia Britannica, written, we believe, by Mr. Barrow, where much statistical information, brought down to within these few years, is collected in a small compass.

END OF VOL. X.

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